REMARKS

A Substitute Specification and Abstract is submitted herewith to place the case in better English form. The Substitute Specification and Abstract contains no new matter. In order that the examiner can satisfy himself in this regard, also submitted herewith is a marked-up copy of the original Specification and Abstract from which the Substitute Specification and Abstract was typed.

Respectfully submitted,

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~~DESCRIPTION~~

AUTOMATIC TRANSMISSION

CROSS-REFENCE TO RELATED APPLICATION

The present application has been filed under 35 USC 371 as a national phase of International Application No. , filed and claims priority of Japanese Application No. , filed , the teachings of which ~~are~~ incorporated by reference herein in its entirety, inclusive of U.S.

Technical Field

The present invention relates to an automatic transmission ~~incorporated in~~ for a vehicle, and more specifically, ~~it relates to the placement construction of~~ to an automatic transmission that can shift between multiple speeds, ~~by being capable~~ with the capability of input of reduced speed rotation to a selected one of the rota~~tion~~ry components of a planetary gear unit.

Background Art

~~Generally, there is known an~~ One type of conventional automatic transmission ~~incorporated in a vehicle or the like which~~ comprises a planetary gear unit with two rows of linked planetary gears, and planetary gear~~s~~ing that ~~can~~ outputs ~~the reduced~~ rotation ~~wherein the rotation~~ at a speed reduced from that of the input shaft, ~~is reduced~~ (for example, see Japanese Unexamined Patent application Publication No. 4-125345 and Japanese Unexamined Patent application Publication No. 2000-274498s. These ~~achieve,~~ publications disclose automatic transmissions providing, for example, six forward speeds ~~levels~~ and one reverse speed ~~level~~, ~~by being capable of~~ with input of ~~reduced~~ rotation at a speed ~~from~~ reduced by ~~the~~ planetary gearing via a clutch, to ~~for example,~~ one of four rota~~tion~~ry components of a planetary gear unit. ~~that has four rotation components~~.

~~Now~~ In recent years, multi-staging of automatic transmissions has been desired from the perspective of improved fuel efficiency, due to environmental problems and so forth. However, in general, multi-staging results in a larger automatic transmission due to the increased number of components, while ~~parts, but~~ from the perspective of ease of ~~ability to~~ mounting on a vehicle, a compact automatic transmission is desired.

The above-mentioned conventional ~~described~~ automatic transmission comprises two clutches for inputting the rotation of the input shaft into a rotary ~~the rotation~~ component of the planetary gear unit, and ~~a~~ planetary gearing ~~for~~ ~~outputting~~ reducing the speed of ~~reduced~~ rotation ~~into the~~ of the input shaft for input into the rotary ~~rotation~~ component of the planetary gear unit. However, ~~in the event that~~ where the two clutches or a hydraulic ~~an oil pressure~~ servo that controls the engagement ~~engaging~~ of the clutches is located ~~configured~~ between the planetary gear unit and the planetary gearing, the unit for transmitting the reduced speed rotation output by ~~of~~ the planetary gearing to a ~~the~~ rotary ~~rotation~~ component of the planetary gear unit must be axially ~~becomes~~ elongated ~~in the axial direction~~.

The ~~An~~ elongated member transmits ~~transmitting~~ the reduced speed rotation ~~s~~ ~~means that the member transmitting~~ and a large torque ~~is elongated~~, and provision of ~~providing~~ an elongated member that can withstand such large torque requires fabrication from ~~providing~~ a relatively thick material ~~that is elongated~~, which prevents ~~providing a~~ compactness of the automatic transmission. Further, the weight of such a unit is increased ~~would be heavier~~, ~~and not only would a lightweight~~

~~automatic transmission be prevented, but~~ , the inertia (~~force of~~ inertia) force is would increased, ~~decreasing~~ the controllability of the automatic transmission is decreased and ~~the shock of~~ speed change shocks ~~would~~ occur more easily.

Further, for example, in order to engage or disengage transfer of the reduced speed rotation ~~output~~ to the planetary gear unit from the planetary gearing, a clutch or brake must be provided. In the case that a clutch is provided, this clutch together with ~~and~~ the above-mentioned ~~described~~ two clutches, ~~in other words~~ total three clutches in all, are necessary. In general, a clutch has a ~~drum-shaped member~~ (clutch drum) that transmits the input rotation to the friction plates, and therefore, with a problem such as relative rotation ~~for example~~, supply of oil pressure to the oil chamber of the oil pressure servo of the clutch must be ~~made~~ from the mid-section of the automatic transmission.

However, if The above-mentioned ~~those~~ three clutches are located ~~configured~~ on one side ~~in the~~ axial ~~direction~~ of the planetary gear unit for example, oil lines for supplying oil pressure to the respective three hydraulic ~~oil pressure~~ servos must be provided ~~are constructed~~ in triplicate in the mid-section of the automatic transmission for example, and the configuration of the oil lines becomes complicated.

SUMMARY OF THE INVENTION

Accordingly, ~~the~~ an object of the present invention is to provide an automatic transmission that achieves multi-staging, and yet is ~~realizes~~ reduced ~~reduction~~ in size. ~~by placement configuration.~~

~~Further,~~ Another object of the present invention is to provide an automatic transmission wherein reduced speed rotation output means and a first clutch are located ~~configured~~ on one axial side ~~in the axial direction~~ of the planetary gear unit, and a ~~the~~ second clutch is located ~~configured~~ on the other side ~~in the~~ axial ~~direction~~ of the planetary gear unit, so as to provide solution~~s~~ of ~~to~~ the above-mentioned problems.

~~Disclosure of Invention~~

Accordingly, the present invention ~~according to Claim 1 is~~ provides an automatic transmission comprising: an input shaft that rotates ~~based on output~~ with the rotation output from ~~of~~ a drive source; a planetary gear unit comprised of first, second, third, and fourth rota~~tion~~ry components~~;~~ reduced speed rotation output means for reducing the speed of the input rotation from the input shaft and for ~~capable of~~ outputting ~~a reduced~~ rotation at the reduced speed to the first rota~~tion~~ry component ~~from the input shaft wherein the rotation speed is reduced~~; a first clutch that selectively connects ~~links~~ the input shaft and the second rota~~tion~~ry component, ~~in a manner capable of disengaging~~; a second clutch that selectively connects ~~links~~ the input shaft ~~and~~ with the third rota~~tion~~ry component, ~~in a manner capable of disengaging~~; and an output unit that outputs the rotation of the fourth rota~~tion~~ry component to a drive wheel transmission mechanism. ~~wherein~~ The reduced speed rotation output means and the first clutch are located ~~configured~~ on one side ~~in the~~ axial ~~direction~~ of the planetary gear unit~~,~~ and ~~wherein~~ the second

clutch is ~~configured~~ located on the other side ~~in the~~ axial ~~direction~~ of the planetary gear unit.

Accordingly, the reduced speed rotation output means and planetary gear unit can be disposed closer to each other ~~in~~ as compar~~ison~~ed with a case wherein the first clutch and second clutch, for example, are ~~configured~~ located between the reduced speed rotation output means and the planetary gear unit, while ~~enabling realizing~~ providing at least five speeds ~~levels~~ forward and one speed ~~level~~ reverse. ~~and~~ Further, the ~~linking~~ Transmitting member ~~for~~ which transmit~~ting~~s the reduced speed rotation~~s~~ can ~~e~~ be made relatively shorter, thereby enabling ~~forming~~ the automatic transmission to be made more ~~in a~~ compact. ~~manner.~~

Further, because the ~~linking~~ transmitting member for transmitting the reduced speed rotation can be made relatively shorter, ~~this~~ it can be more lightweight, and further, because the inertia (interial force ~~of inertia~~) ~~can be smaller~~ is reduced, the controllability of the automatic transmission can be improved, and the occurrence of speed change shock can be reduced.

Further, ~~for example~~ in the case that the reduced speed rotation output means has a clutch, three clutches ~~are~~ in all are required ~~configured~~, but compared to the case wherein the three clutches are ~~configured~~ located on one side of the planetary gear unit, the construction of the oil lines supplying the ~~oil~~ hydraulic ~~pressure~~ servos of those clutches is easier, ~~and~~ the manufacturing process ~~can be~~ is simplified and the cost~~s~~ is

reduced.

The automatic transmission of the present invention ~~according to Claim 2 is~~ ~~configured~~ may further ~~comprising~~ include a ~~linking~~ transmitting member for linking the reduced speed rotation output means and the planetary gear unit, wherein the first clutch is ~~configured on the inner circumference side~~ located radially inward of the ~~linking~~ transmitting member.

~~The present invention according to Claim 3 is configured with~~ The reduced speed rotation output means ~~further comprising~~ may include an input ~~rotation component~~ rotary element for ~~inputting~~ receiving input of rotation~~s~~ of the input shaft in a continuous manner ~~at all times~~, ~~a fixing component for fixing rotations at all times~~ a fixed element, ~~a speed reduction planetary gear that has~~ a reduced speed rota~~tion component that rotates at the reduced rotation~~ry element, and a third clutch ~~that can link~~ for controlling connection, through the ~~linking~~ transmitting member, between the reduced speed rota~~tion component~~ry element and the first rota~~tion~~ry component ~~in a manner capable of disengaging~~, wherein the reduced speed rotation is transmitted to the first rota~~tion~~ry component by engagement of the third clutch ~~engaging~~.

reduced speed rotation output means

The automatic transmission of the present invention ~~according to Claim 4 has~~ may have the first clutch ~~configured on the inner circumference side~~ located radially inward of the third clutch.

Accordingly, the third clutch, which must transmit a relatively large torque ~~to transmit~~ at the reduced ~~rotation~~ speed, can be ~~configured~~ located on the outer circumferen~~ce~~tial side, and this third clutch and ~~the oil pressure~~ its hydraulic servo ~~thereof~~ can have a

larger diameter. More specifially ~~Particularly~~, the pressure receiving area of the oil chamber of the hydraulic ~~oil pressure~~ servo can be increased, and the capacity for torque transmission of this third clutch is thereby ~~can be~~ increased. However, by locating ~~configuring~~ the first clutch, which can have a smaller capacity for torque transmission compared to the third clutch, on the inner circumferen~~ce~~tial side, the automatic transmission can be formed more compact.

~~The present invention according to Claim 5 is configured with~~ The third clutch includes ~~comprising a~~ friction members, ~~and~~ a drum unit and a hub unit that links through ~~with~~ the friction members; ~~wherein; the hub unit links~~ with the reduced speed rota~~tion~~ry component. The drum unit forms a hydraulic ~~an oil pressure~~ servo with a piston sealed in an oil-tight manner, and links with the first rota~~tion~~ry components. ~~and~~ The first clutch is located radially inward ~~configured on the inner circumference side~~ of the drum unit ~~member~~.

~~The present invention according to Claim 6 is configured with~~ The friction members of the third clutch are preferably located radially outward ~~on the outer circumference side~~ of the speed reduc~~tion~~ing planetary gear, ing with the hydraulic ~~wherein an oil pressure~~ servo of the third clutch ~~is~~ disposed adjoining the speed reduc~~tion~~ing planetary gear is on the opposite axial side of the planetary gear unit. ~~in the axial direction.~~

~~The present invention according to Claim 7 is configured with an oil pressure~~ The hydraulic servo of a first brake, for

braking ~~retaining~~ the first rota~~ting~~ry component of the planetary gear unit to which reduced speed rotation is input, is located ~~configured on the~~ radially outward ~~outer circumference~~ of the hydraulic ~~oil pressure~~ servo of the third clutch.

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~~The present invention according to Claim 8 is configured with~~ The reduced speed rotation output means may ~~further~~ include ~~comprising~~ an input rotation component capable of inputting rotations of the input shaft, a fixing component for fixing rotations at all times, a speed reduction planetary gear unit that has a reduced rotation component that links to the first rotation component at all times, and rotates at the reduced rotation, and a third clutch that can link the linking member between the input shaft and the input rotation component in a manner capable of disengaging; wherein the reduced rotation is transmitted to the first ~~rotation component by the third clutch engaging~~

~~The present invention according to Claim 9 is configured with a fixing component~~ The intermediate element of the speed reduc~~tion~~ing planetary gear~~is~~ing may be fixed ~~and configured on~~ to a first boss ~~unit~~ extending from one ~~edge of a~~ side wall of a case ~~; an oil pressure~~ with the hydraulic servo of the third clutch ~~is configured~~ mounted on the ~~outside of~~ the first boss. ~~unit, an oil pressure~~ Likewise, the hydraulic servo of the second clutch is ~~configured~~ located on the outside of the second boss ~~unit~~ that extends from another ~~edge of a~~ side wall of the case. The first clutch is ~~configured~~ located adjoin~~ed to~~ing the

planetary gearing and ~~also comprises a~~ includes friction members, ~~and an~~ a hydraulic ~~oil pressure~~ servo for ~~pressurizing~~ engaging the friction members, and a drum unit and hub unit ~~configured~~ integrally with the ~~oil pressure~~ hydraulic servo, ~~and~~ wherein the drum unit is linked with the input shaft.

~~The present invention according to Claim 10 is configured~~ In one embodiment, with the reduced speed rotation output means ~~further comprising~~ includes an input rota~~tion component~~ry element for ~~inputting~~ receiving input of rotation~~s~~ of the input shaft, ~~a fixing component for fixing~~ an fixable element for being fixed against rotation~~s~~, a ~~speed reduction planetary gear that has a~~ reduced speed rota~~tion~~ry ~~component~~ element that is linked to the first rota~~tion~~ry component at all times, and rotates at the reduced ~~rotation~~ speed, a third clutch for selectively connecting, through the transmitting ~~that can link the linking~~ member, ~~between~~ the input shaft and the input rota~~tion component~~ry element ~~in a manner capable of disengaging~~, and a third brake ~~capable of~~ for fixing the fixable element against ~~the~~ rotation~~s of the fixing component~~, wherein the reduced speed rotation is transmitted to the first rota~~tion~~ry component by engagement of the third clutch and the third brake~~ engaging.~~

reduced speed rotation output means

In this embodiment ~~The present invention according to Claim 11 is configured further comprising: a linking member for linking the reduced rotation output means and the planetary gear unit; wherein~~ the third clutch ~~is~~ may be disposed ~~on the inner circumference side~~ radially inward of the ~~linking~~ transmitting member.

~~With the present invention according to Claim 12,~~ The first clutch and the third clutch ~~are configured~~ may be located axially adjacent ~~in~~

~~the axial direction, on the inner circumference side~~ and radially inward of the ~~linking~~ transmitting member.

~~The present invention according to Claim 13 is configured with~~ The third clutch ~~comprising a~~ includes friction members and ~~an oil pressure~~ a hydraulic servo for ~~pressurizing~~ engaging the friction members~~;~~ wherein the ~~oil pressure~~ hydraulic servo is ~~configured~~ located on the ~~opposite~~ side ~~in the axial direction~~ of the speed reduc~~tion~~ing (second) planetary gear unit axially opposite the first planetary gear ~~as to the friction~~ un ~~member~~; and wherein a drum unit that ~~configures a~~ forms the cylinder of the ~~oil pressure~~ hydraulic servo is linked with the input shaft.

~~With the present invention according to Claim 14,~~ The ~~oil pressure~~ hydraulic servo of the third clutch ~~is configured~~ may be located adjoining the ~~oil pressure~~ hydraulic servo of the first clutch, between the ~~oil pressure~~ hydraulic servo of the first clutch and the friction ~~material~~ plates of the third clutch.

~~The present invention according to Claim 15 is configured further comprising: a linking member for linking the reduced rotation output means and the planetary gear unit; wherein~~ The third brake ~~is configured on the opposite~~ may be located on the side ~~in the axial direction~~ of the second planetary gear unit PR axially opposite ~~as to~~ the ~~speed reduction~~ first planetary gear unit PU.

~~The present invention according to Claim 16 is configured with~~ The ~~oil pressure~~ hydraulic servo of the third brake ~~provided~~ may be formed in ~~a~~ the case.

~~The present invention according to Claim 17 is~~

~~configured with the third clutch comprising a friction member and an oil pressure servo for pressurizing the friction member; wherein the oil pressure servo is configured on the opposite side in the axial direction of the speed reduction planetary gear as to the friction member; and wherein a drum unit that configures a cylinder of the oil pressure servo is linked with the input shaft.~~

~~The present invention according to Claim 18 is~~ In yet another embodiment, ~~configured with~~ the reduced speed rotation output means ~~further~~ includes ~~comprising~~ an input rota~~tion component~~ry element for receiving input~~ting~~ of rotation~~s~~ from ~~of~~ the input shaft, ~~a fixing component~~ a fixable element for being fixed ~~for fixing~~ against rotation~~s~~, ~~a speed reduction planetary gear that has a~~ a reduced speed rota~~tion component that~~ry element which rotates at the reduced speed ~~rotation~~ and ~~that~~ which is connected to the first rota~~ting~~ry component at all times, and a third brake ~~capable of~~ for fixing the fixable element against ~~the~~ rotation~~s~~ ~~of the fixing component;~~ wherein the reduced speed rotation is transmitted to the first rota~~tion~~ry component by engagement of the third brake, ~~engaging.~~

~~With the present invention according to Claim 19, the third brake is configured on the opposite side in the axial direction of the planetary gear unit as to the speed reduction planetary gear;~~

~~wherein the oil pressure servo of the third brake is provided in a case.~~

The present invention according to Claim 20 is

~~configured such that six forward speed levels and one reverse speed level can be achieved, and in the case of the fourth forward speed level the first clutch and the second clutch are engaged.~~

~~This~~ The automatic transmission of the foregoing embodiment achieves six forward speeds and one reverse speed, and ~~at~~ in fourth speed forward the first and second clutches are both engaged ~~together~~, that is to say the automatic transmission is directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, ~~and particularly when mounted on a vehicle, in the event that~~ so that when the vehicle is running at ~~a~~ high speed, the engine ~~revolutions~~ speed can be relatively lower~~ed~~, ~~and this contributes to the quietness of~~ thereby allowing the vehicle ~~while~~ to run~~ning~~ more quietly at ~~a~~ high speed.

~~The present invention according to Claim 21 is configured such that, in a speed line chart illustrating the revolutions of the first, second, third, and fourth rotation components with the vertical axis, and the gear ratio of the first, second, third, and fourth rotation components with the horizontal axis in a corresponding manner; the first rotation component to which the reduced rotation is input is positioned at the farthest edge in the horizontal direction, with the third rotation component, the fourth rotation component linked to the output member, and the second rotation component, corresponding in that order.~~

~~With the present invention according to Claim 22, the~~

GP The first planetary gear unit is preferably a multiple ~~type~~ planetary gear unit, comprising a first sun gear, a long pinion which meshes with the first sun gear, a short pinion which meshes with the long pinion, a carrier for rotat~~ionally~~ably supporting the long pinion and the short pinion, a second sun gear meshing with the short pinion, and a ring gear meshing with the long pinion. ~~wherein~~ In such an embodiment the first rota~~tion~~ry component is the first sun gear ~~capable of~~ which receives input~~ting~~ of the reduced speed rotation ~~of~~ from the reduced speed rotation output means, and which ~~is capable of being~~ can be fixed against rotation by ~~the retaining~~ engagement of the first brake, ~~and wherein~~ the second rota~~tion~~ry component is the second sun gear ~~capable of~~ which receives input~~ting~~ of the rotation~~s~~ of the input shaft ~~by the~~ upon engag~~ing~~ement of the first clutch, ~~and wherein~~ the third rota~~tion~~ry component is the carrier ~~capable of~~ which receives input~~ting~~ of the rotation~~s~~ of the input shaft ~~by the~~ upon engag~~ing~~ement of the second clutch, and which is ~~capable of being~~ fixed against rotation by ~~the retaining~~ engagement of the second brake, and ~~wherein~~ the fourth rota~~tion~~ry component is the ring gear linked to the output member.

The ~~present invention according to Claim 23 comprises~~ automatic transmission according another embodiment includes a pair of the planetary gear units each comprising a first sun gear, a second sun gear linked to the first sun gear, a first carrier meshing with the first sun gear, a second carrier meshing with the second sun gear, a first ring gear linked to the second carrier, and a second ring gear meshing with the second carrier. ~~wherein~~ In This embodiment the first rota~~tion~~ry

component is the second ring gear ~~capable of~~ which receives input~~ting~~ of the reduced speed rotation ~~of~~ from the reduced speed rotation output means, and which is capable of being fixed against rotation by ~~the retaining~~ engagement of the first brake~~s~~ and ~~wherein~~ the second rota~~tion~~ry component is the first sun gear and the second sun gear which receive ~~rage capable of~~ input~~ting the~~ of the rotation~~s~~ of the input shaft ~~by the~~ upon engag~~ing~~ement of the first clutch. ~~and wherein~~ The third rota~~tion~~ry component is the second carrier and the first ring gear which receive ~~capable of~~ input~~ting~~ of the rotation~~s~~ of the input shaft ~~by the~~ upon engaging of the second clutch, and which are ~~also capable of being~~ fixed by ~~the retaining~~ engagement of the second brake~~,~~ ~~and wherein~~ The fourth rota~~tion~~ry component is a first carrier linked to the output member.

~~The present invention according to Claim 24 is configured wherein~~ In the foregoing embodiment, in ~~the~~ first speed forward, the first clutch ~~is engaged~~ and the second brake are engaged ~~is retained~~; ~~and wherein,~~ in ~~the~~ second speed forward, the first clutch ~~is engaged~~ and the first brake are engaged ~~is retained~~; ~~and wherein,~~ in ~~the~~ third speed forward, reduced speed rotation is input to the first rota~~tion~~ry component from the reduced speed rotation output means, and the first clutch is engaged; ~~and wherein,~~ in ~~the~~ fourth speed forward, the first clutch and the second clutch are both engaged; ~~and wherein,~~ in ~~the~~ fifth speed forward, reduced speed rotation is input to the first rota~~tion~~ry component from the reduced speed rotation output means, and the second

optionally along with eng

clutch is engaged; ~~and wherein,~~ in the sixth speed forward, the second clutch ~~is engaged~~ and the first brake ~~is~~ are engaged ~~retained~~; and ~~wherein,~~ in the first speed reverse, reduced speed rotation is input to the first rota~~tion~~ component from the reduced speed rotation output means, and the second brake is engaged ~~retained,~~ In this embodiment ~~whereby~~ six forward speeds ~~levels~~ and one reverse speed are provided ~~level can be achieved~~.

No 9 → ~~With the present invention according to Claim 25, six forward speed levels and one reverse speed level can be achieved, and in the case of the~~ In fifth forward speed ~~level~~ both the first clutch and the second clutch ~~are~~ may be engaged, to provide a ~~Accordingly, this achieves six forward speeds and one reverse speed, and at fifth speed forward the first and second clutches are engaged together, that is to say~~ directly coupled state, ~~or at fifth speed forward~~. Therefore, between first speed forward and fourth speed forward, the ~~width~~ ranges of the gear ratios can be relatively narrower ~~specified in detail~~, and therefore when ~~particularly when mounted on a vehicle, in the event that~~ the vehicle is running at a low to moderate speed, the engine speed can be ~~utilized with~~ better optimized ~~revolutions~~, and fuel consumption ~~cost~~ can be reduced. ~~improved with the vehicle running at a low to moderate speed.~~

~~The present invention according to Claim 26 is configured such that, in a speed line chart illustrating the revolutions of the first, second, third, and fourth rotation components with the vertical axis, and the gear ratio of the~~

~~first, second, third, and fourth rotation components with the horizontal axis in a corresponding manner; the first rotation component to which the reduced rotation is input is positioned at the farthest edge in the horizontal direction, with the fourth rotation component linked to the output member, the third rotation component, and the second rotation component, corresponding in that order.~~

Alternatively, in embodiments wherein ~~With the present invention according to Claim 27,~~ the planetary gear unit is a multiple ~~type~~ planetary gear unit, ~~comprising a first sun gear, a long pinion which meshes with the first sun gear, a short pinion which meshes with the long pinion, a carrier for rotationally supporting the long pinion and the short pinion, a second sun gear meshing with the short pinion, and a ring gear meshing with the long pinion, wherein~~ the first rota~~tion~~ry component is the second sun gear which receives ~~capable of~~ input~~ting~~ of the reduced speed rotation of the reduced speed rotation output means; the fixable rotary element ~~and wherein the rotation component~~ is a ~~the~~ carrier which receives ~~capable of~~ input~~ting~~ of the rotation~~s~~ of the input shaft by ~~the~~ engag~~ing~~ement of the first clutch, and which is ~~capable of being~~ fixed against rotation by ~~the retaining~~ engagement of the first brake; ~~and wherein~~ the third rota~~tion~~ry component is the first sun gear which receives ~~capable of~~ input~~ting~~ of the rotation~~s~~ of the input shaft upon ~~by the~~ engag~~ing~~ement of the second clutch, and which is ~~capable of being~~ fixed against rotation by engagement ~~by the retaining~~ of the second brake; and ~~wherein~~ the fourth rota~~tion~~ry component is the ring

~~gear linked to the output member.~~

In the foregoing alternative embodiment ~~The present invention according to Claim 28 is configured such that~~, in ~~the~~ first speed forward, reduced speed rotation is input to the first rota~~tion~~ry component from the reduced speed rotation output means, and the first brake is engaged ~~retained~~; ~~and wherein,~~ in ~~the~~ second speed forward, reduced speed rotation is input to the first rota~~tion~~ry component from the reduced speed rotation output means, and the second brake is engaged ~~retained~~; ~~and wherein,~~ in ~~the~~ third speed forward, reduced speed rotation is input to the first rota~~tion~~ry component from the reduced speed rotation output means, and the second clutch is engaged; ~~and wherein,~~ in ~~the~~ fourth speed forward, reduced speed rotation is input to the first rota~~tion~~ry component from the reduced speed rotation output means, and the first clutch is engaged; ~~and wherein,~~ in ~~the~~ fifth speed forward, the first clutch and the second clutch are both engaged; ~~and wherein,~~ in ~~the~~ sixth speed forward, the first clutch ~~is engaged~~ and the second brake are both engaged ~~is retained~~; and ~~wherein,~~ in ~~the~~ first speed reverse, the second clutch ~~is engaged~~ and the first brake are engaged ~~is retained,~~ ~~whereby~~ Thus, this embodiment also provides six forward speeds ~~levels~~ and one reverse speed. ~~level can be achieved.~~

~~The present invention according to Claim 29 is configured with~~ The first clutch may be located on the ~~configured on the opposite~~ axially opposite side ~~in the axial direction~~ of the first planetary gear unit ~~as to~~ the speed reduc~~tion~~ing second planetary gear unit.

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¶ In the embodiments mentioned above the "fixed element" may be a boss on the interior of the case, and optionally a carrier fixed to the case, carrying pinions meshed with the input rotary element and the reduced speed rotary element. Likewise, the "fixable element" may be a carrier which can be fixed against rotation by engagement of a brake and which carries pinions meshed with the input rotary element and the reduced speed rotary elements.

~~With the present invention according to Claim 30~~ Thus, the first clutch ~~is a clutch which~~ engages at ~~a~~ relatively low to medium speeds ~~level~~.

No ¶ Accordingly, when this second clutch is disengaged at relatively high speeds ~~levels~~ or in ~~at the~~ reverse ~~speed level~~, ~~particularly~~ the unit linking this second clutch and the third rotary ~~rotation~~ component rotates at a relatively high speed or in the opposite direction. On the other hand, a case may occur wherein the transmitting ~~linking~~ member, that transmits the reduced speed rotation from the reduced speed rotation output means, will rotate ~~rotates~~ at reduced speed ~~rotations~~ or is engaged, and the difference in speeds ~~revolutions~~ may be great. However, because this second clutch is located on the ~~opposite~~ side of opposite the reduced rotation output means ~~via~~ the first planetary gear unit, ~~that is to say,~~ the unit rotating at ~~with a~~ a relatively high speed ~~rotation~~ or in reverse rotation and the unit rotating at the ~~with~~ reduced speed ~~rotation~~ of the ~~this~~ reduced speed rotation output means (particularly the linking member) can be separated. ~~and configured.~~ For example, compared to the case wherein those units are arranged in ~~configured with~~ a multiple axis configuration ~~construction~~ and are in contact, a decrease in ~~decreases~~ efficiency of the automatic transmission due to a relative rotation ~~s~~ between these units can be prevented.

In the foregoing embodiment ~~With the present invention according to Claim 31~~, the second clutch is ~~is a clutch that~~ engage~~s~~ in ~~at the~~ reverse. ~~level.~~

No ¶ Accordingly, when the ~~this~~ second clutch is engaged in ~~the~~

reverse ~~level~~, the reduced speed rotation unit (particularly the transmitting ~~linking~~ member) of the reduced speed rotation output means rotates in reverse. ~~direction~~ ~~On the other hand,~~ In a case ~~may occur~~ wherein the unit linking this second clutch and the third rotary ~~rotation~~ component is rotating at the speed of ~~becomes the~~ rotation of the input shaft due to the ~~this~~ second clutch being engaged, ~~and~~ the difference in rotational speeds ~~revolutions~~ may be great. However, because ~~this~~ the second clutch is located on the ~~opposite~~ side of the opposite the reduced speed rotation output means ~~via the~~ first planetary gear unit, ~~that is to say~~, the unit with ~~a~~ reverse rotation (particularly the transmitting ~~linking~~ member) and the unit that rotates with ~~takes on~~ the rotation of the input shaft can be ~~configured~~ separated. As ~~For example,~~ compared to ~~the case wherein these units are configured with~~ a multiple axis construction wherein these units ~~and~~ are in contact, decrease~~d~~ in efficiency of the automatic transmission due to relative rotation~~s~~ between these units can be avoided ~~prevented~~.

~~The present invention according to Claim 32 is configured with~~ The first clutch includes ~~comprising a~~ friction plates having their ~~of which the~~ inner peripheries ~~circumferential side is~~ splined to a member linked to the second rotation component, a first drum ~~member~~ encompassing an oil pressure servo and which is splined on its ~~to the~~ outer circumferential surface to ~~side of the~~ friction plates, a first piston member for engaging ~~pressing~~ the friction plates, and a first hydraulic ~~oil pressure~~ servo oil pressure chamber formed by liquid-tight seals ~~sealing~~ between the inner circumferential surface ~~side~~ of the

first piston member and the first drum member, ~~so as to be liquid-tight; wherein~~ The second clutch comprises ~~a~~ friction plates ~~of which the~~ having their inner ~~circumferential side is~~ edges splined to a member linked to the third rotation component, a second drum ~~member~~ encompassing an oil pressure servo and which is splined to the outer ~~circumferential side~~ edges of ~~the~~ friction plates, and which is disposed ~~in~~ on the inner circumferen~~ce~~tial side of a member linked to the second rota~~tion~~ry component, a second piston member for ~~pressing~~ engaging the friction plates, and a second ~~oil pressure~~ hydraulic servo oil pressure chamber formed by seal~~ing~~s between the inner circumferential ~~side~~ surface of the second piston member and the input shaft, and between the outer circumference ~~side~~ surface and the second drum member, ~~so as to be liquid-tight~~.

~~The present invention according to Claim 33 is configured with~~ The output member may be disposed axially between the first planetary gear unit and the reduced speed rotation output means, ~~in the axial direction~~.

Accordingly, the output unit can be ~~configured~~ located in approximately the axial center ~~in the axial direction~~ of the automatic transmission. ~~For example~~ Thus, when the automatic transmission is mounted on the vehicle, enlarg~~ing~~ment towards ~~one direction of the axis (particularly in~~ the rear ~~direction~~ (when the end receiving the input ~~side~~ from the drive source is the "front") ~~direction) can be prevented~~ becomes unnecessary because the output member

is mounted to mate with ~~match~~ the drive wheel transmission device. Because of this, particularly in the case of a ~~an~~ FF vehicle, ~~the~~ interference with ~~toward~~ the front wheels is reduced, and the mountability on a vehicle is ~~can be~~ improved, ~~such as~~, the steering angle is ~~being~~ greatly increased. for example,

~~The present invention according to Claim 32 is configured with~~ The output member may be located axially ~~disposed~~ between the planetary gear unit and the second clutch. ~~in the axial direction.~~

No ¶ → Accordingly, the planetary gear unit and the reduced speed rotation~~s~~ output means can be arranged ~~disposed~~ even closer together, and the transmitting ~~linking~~ member can be further shortened.

~~The present invention according to Claim 34 is configured with~~ The reduced rotation output means may be in the form of ~~comprising~~ a speed reduc~~tion~~ing second planetary gear unit, more specifically, ~~formed of~~ a double pinion planetary gear unit~~s~~, wherein the speed reduc~~tion~~ing second planetary gear unit, the first planetary gear unit, and the output member, are arranged ~~provided~~ coaxially with the input shaft.

~~The present invention according to Claim 35 is configured further comprising~~ A differential unit ~~for~~ outputs~~ting~~ rotation~~s~~ to the drive~~ing~~ wheels, ~~and~~ a counter shaft unit is ~~for~~ engaged with ~~engaging~~ the differential unit, and ~~wherein~~ the output member may be ~~is~~ a counter gear meshing with the counter shaft unit.

Brief Description of the Drawings

Fig. 1 is a schematic cross-sectional ~~diagram~~ view ~~illustrating~~ of an automatic transmission ~~device of an automatic transmission relating~~ according to a first embodiment; Fig. 2 is a~~n~~ operation~~al~~s table of ~~an~~ of the automatic transmission ~~relating to~~ of the first embodiment; Fig. 3 is a speed line diagram ~~of an automatic transmission relating to~~ for the first embodiment; Fig. 4 is a schematic cross-sectional ~~diagram~~ view ~~illustrating an automatic transmission device~~ of an automatic transmission ~~relating~~ according to a second embodiment; Fig. 5 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ of an automatic transmission ~~relating~~ according to a third embodiment; Fig. 6 is a table of ~~an~~ operation~~al~~s ~~table~~ of ~~an~~ the automatic transmission ~~relating to~~ of the third embodiment; Fig. 7 is a speed line diagram ~~of an~~ for the automatic transmission ~~relating to~~ of the third embodiment; Fig. 8 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a fourth embodiment; Fig. 9 is a~~n~~ operation~~al~~s table of ~~an~~ for the automatic transmission ~~relating to~~ of the fourth embodiment; ~~and~~ Fig. 10 is a speed line diagram ~~of an~~ for the automatic transmission ~~relating to~~ of the fourth embodiment.

~~Also,~~ Fig. 11 is a schematic cross-sectional ~~diagram~~ view ~~illustrating an automatic transmission device~~ of an automatic transmission ~~relating~~ according to a fifth embodiment; Fig. 12 is a schematic cross-sectional ~~diagram illustrating an~~ view

~~automatic transmission device~~ of an automatic transmission ~~relating to~~ of a sixth embodiment; Fig. 13 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating to~~ of a seventh embodiment; Fig. 14 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to an eighth embodiment; Fig. 15 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a ninth embodiment; Fig. 16 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a tenth embodiment; Fig. 17 is a schematic cross-sectional view ~~diagram illustrating an automatic transmission device~~ of an automatic transmission ~~relating to~~ of an eleventh embodiment;

Fig. 18 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic ~~transmission relating~~ according to a twelfth embodiment; Fig. 19 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a thirteenth embodiment; ~~and~~ Fig. 20 is a schematic cross-sectional ~~diagram illustrating an automatic transmission device~~ view of an automatic transmission ~~relating~~ according to a fourteenth embodiment.

~~Also,~~ Fig. 21 is a schematic cross-sectional ~~diagram~~ view

~~illustrating an automatic transmission device~~ of an automatic transmission according ~~relating~~ to a fifteenth embodiment;

¶ Fig. 22 is a~~n~~ operations ~~operational~~ table of the ~~an~~ automatic transmission of ~~relating to~~ the fifteenth embodiment;

¶ Fig. 23 is a speed line diagram for the ~~of an~~ automatic transmission of ~~relating to~~ the fifteenth embodiment;

¶ Fig. 24 is a schematic cross-sectional view of ~~diagram illustrating~~ an automatic transmission ~~device of an automatic transmission relating~~ according to a sixteenth embodiment;

¶ Fig. 25 is a~~n~~ operations ~~operational~~ table of the ~~an~~ automatic transmission of ~~relating to~~ the sixteenth embodiment;

¶ Fig. 26 is a speed line diagram for the ~~of an~~ automatic transmission of ~~relating to~~ the sixteenth embodiment;

¶ Fig. 27 is a schematic cross-sectional view ~~diagram illustrating an automatic transmission device~~ of an automatic transmission according ~~relating~~ to a seventeenth embodiment;

¶ Fig. 28 is a~~n~~ operations ~~operational~~ table of the ~~an~~ automatic transmission of ~~relating to~~ the seventeenth embodiment;

¶ ~~and~~ Fig. 29 is a speed line diagram for the ~~of an~~ automatic transmission of ~~relating to~~ the seventeenth embodiment;

¶ ~~Also,~~ Fig. 30 is a schematic cross-sectional view ~~diagram illustrating an automatic transmission device~~ of an automatic transmission according ~~relating~~ to an eighteenth embodiment;

¶ Fig. 31 is a~~n~~ operations ~~operational~~ table of the ~~an~~ automatic transmission of ~~relating to~~ the eighteenth embodiment;

¶ Fig. 32 is a speed line diagram for the ~~of an~~ automatic transmission of ~~relating to~~ the eighteenth embodiment;

¶ Fig. 33 is a schematic cross-

sectional view ~~diagram illustrating an automatic transmission device~~ of an automatic transmission of ~~relating to~~ a nineteenth embodiment; Fig. 34 is ~~an~~ operations ~~operational~~ table of the ~~an~~ automatic transmission of ~~relating to~~ the nineteenth embodiment; Fig. 35 is a speed line diagram for the ~~of an~~ automatic transmission of ~~relating to~~ the nineteenth embodiment; Fig. 36 is a schematic cross-sectional view ~~diagram illustrating an automatic transmission device~~ of an automatic transmission according ~~relating~~ to a twentieth embodiment; Fig. 37 is ~~an~~ operations ~~operational~~ table of the ~~an~~ automatic transmission of ~~relating to~~ the twentieth embodiment; ~~and~~ Fig. 38 is a speed line diagram for the ~~of an~~ automatic transmission of ~~relating to~~ the twentieth embodiment;

~~Also,~~ Fig. 39 is a schematic cross-sectional view ~~diagram illustrating an automatic transmission device~~ of an automatic transmission according ~~relating~~ to a twenty-first embodiment; Fig. 40 is a schematic cross-sectional view ~~diagram illustrating an automatic transmission device~~ of an automatic transmission according ~~relating~~ to a twenty-second embodiment; Fig. 41 is a schematic cross-sectional view ~~diagram illustrating an automatic transmission device~~ of an automatic transmission according ~~relating~~ to a twenty-third embodiment; Fig. 42 is a schematic cross-sectional view ~~diagram illustrating an automatic transmission device~~ of an automatic transmission according ~~relating~~ to a twenty-fourth embodiment; and Fig. 43 is a schematic cross-sectional view ~~diagram illustrating an automatic~~

~~transmission device~~ of an automatic transmission ~~relating~~ according to a twenty-fifth embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

~~Best Mode for Carrying Out the Invention~~

First Embodiment

~~The~~ A first embodiment ~~relating to~~ of the present invention will be described, with reference to Fig. 1 through Fig. 3 below. ~~Fig. 1 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the first embodiment, Fig. 2 is an operational table of an automatic transmission relating to the first embodiment, Fig. 3 is a speed line diagram of an automatic transmission relating to the first embodiment.~~

No ¶ Fig. 1 shows ~~An~~ an automatic transmission 1, according ~~relating~~ to the first embodiment ~~according to~~ of the present invention ~~has an automatic transmission device 1, as illustrated in Fig. 1.~~ ~~This~~ that is particularly ~~favorable~~ well suited for ~~an~~ a FF (front engine, front wheel drive) vehicle. ~~and has~~ A case includes a torque converter ~~comprising a~~ housing ~~case~~ (not illustrated) and a transmission case 3, which ~~and within this housing case is configured a torque converter, not illustrated, within this transmission case 3 is configured an~~ houses the automatic transmission ~~device~~ 1_1, a counter shaft unit (drive wheel transmission device) (not illustrated) and a differential unit (drive wheel

transmission device).

~~This~~ The torque converter ~~is configured, for example, on the axis that~~ is centered on the axis of ~~an~~ input shaft 2 of the automatic transmission ~~device~~ 1_1, which is on the same axis as the output shaft of the engine (not illustrated). ~~and this automatic transmission device 1_1 is configured on the output shaft of this engine, in other words, the axis that is centered on an input shaft 2.~~ Further, the above-mentioned counter shaft unit ~~is configured on~~ includes a counter shaft (not illustrated) aligned on an axis ~~that is~~ parallel to the input shaft 2, and the above-mentioned differential unit ~~is configured so as to have~~ has a lateral axle aligned ~~, not illustrated, on an axis that is~~ parallel to ~~this~~ the counter shaft.

~~Next, an automatic transmission device 1_1 of an automatic transmission relating to the first embodiment will be described, with reference to Fig. 1.~~ As illustrated in Fig. 1, arranged along the input shaft 2, ~~has~~ a ~~are~~ first planetary gear unit PU and a second planetary gear unit (reduced rotation output means) PR. ~~This~~ The first planetary gear unit PU is a multiple type planetary gear unit ~~,~~ which ~~has~~ includes a sun gear (the second rota~~tion~~ry component) S2, a carrier (the third rota~~tion~~ry component) CR2, a ring gear (the fourth rota~~tion~~ry component) R3, and a sun gear (the first rota~~tion~~ry component) S3, as the four rota~~tion~~r components. ~~wherein~~ The carrier CR2 has a long pinion PL that meshes with ~~a~~ the sun gear S3 and ~~a~~ the ring gear R3, and a short pinion PS

that meshes with ~~a~~ the sun gear S2, ~~which~~ pinions are also meshed to one another. Further, the ~~above mentioned~~ second planetary gear unit PR is a so-called double planetary gear unit that has a carrier CR1, which rotatably supports ~~wherein~~ a pinion Pb mesh~~es~~ing with a ring gear R1 and a pinion Pa mesh~~es~~ing with a sun gear S1, which pinions are also mesh~~es~~ed one with another.

Arranged ~~On~~ on the ~~above mentioned~~ input shaft 2 ~~is configured~~ are a multi-disc clutch (first clutch) C1, which comprises ~~an oil pressure~~ a hydraulic servo 11, ~~a~~ friction plates 71, ~~a drum-shaped member~~ 21 ~~that forms~~ a clutch drum, and a hub unit 22 ~~liked to a~~ linked to sun gear S2 on the inner circumferen~~ce~~tial side; and a multi-disc clutch (third clutch) C3, which ~~has an oil pressure~~ includes a hydraulic servo 13, ~~a~~ friction plates 73, and a ~~drum-shaped member 25 that forms a~~ clutch drum 25 on the outer circumferen~~ce~~tial side. Further, ~~on the outer circumference side~~ located radially outward of the drum ~~-shaped member~~ 25 is ~~configured~~ a multi-disc brake B1 (first brake) which has ~~an oil pressure~~ a hydraulic servo 14 and ~~a~~ friction plates 74.

~~This oil pressure~~ Hydraulic servo 11 ~~is constructed from~~ includes a piston unit b for ~~pressurizing~~ engaging the friction plates 71, a drum ~~-shaped member~~ 21 that has a cylinder unit e, an ~~oil pressure servo~~ oil chamber (hereafter, simply "oil chamber") "a" ~~which is~~ formed by ~~sealing~~ interposed between ~~this~~ piston unit b and ~~this~~ cylinder unit e ~~with~~ seal rings f and g, a return spring c that ~~presses this~~ biases piston unit b toward~~s~~ ~~this~~ oil chamber "a", and a return plate d that ~~absorbs the energy of this~~ bears the force of return spring c.

~~Now, for~~ In the ~~following~~ description~~s~~ to follow, each ~~oil pressure~~ hydraulic servo shall be considered as being constructed similarly, i.e. as having ~~from~~ an oil chamber "a", a piston unit b, a return spring c, a return plate d, a cylinder unit e, and seal rings f and g, and, as such, ~~these~~ description~~s~~ thereof will not be ~~given~~ repeated.

The oil chamber "a" of this ~~oil pressure~~ hydraulic servo 11 is connected to an oil line 2a which is formed on the ~~above-mentioned~~ input shaft 2, and this oil line 2a ~~is provided along one edge of the case 3, and~~ is connected to the oil line 91 of the boss ~~unit~~ 3a which is ~~provided on~~ in the form of a sleeve surrounding the input shaft 2, ~~in a sleeve form~~. Further, this oil line 91 is connected to an oil pressure control unit, not illustrated. In other words, due to the above-mentioned ~~oil pressure~~ hydraulic servo 11 being ~~configured~~ mounted on the input shaft 2, an oil ~~line~~ supply path from the oil pressure control unit, not illustrated, to the oil chamber "a" of the ~~oil pressure~~ hydraulic servo 11 is ~~configured,~~ connected simply by providing one set of seal rings 81 ~~to seal~~ between the boss ~~unit~~ 3a ~~of the case 3~~ and the input shaft 2.

Further, the oil chamber "a" of the above-mentioned ~~oil pressure~~ hydraulic servo 13 is directly connected to an oil line 92 of the above-mentioned boss ~~unit~~ 3a, and this oil line 92 is connected to an oil pressure control unit, not illustrated. ~~In other words, for the above-mentioned oil pressure~~ Thus, the hydraulic servo 13~~, an oil line from the oil pressure control unit, not illustrated, to the~~ has its oil chamber "a" ~~of the oil pressure~~ connected to the oil pressure

control unit ~~servo 13 is configured,~~ simply by providing one set of seal rings 80 ~~to seal~~ between the boss ~~unit~~ 3a ~~of the case 3~~ and the drum~~-shaped member~~ 25.

The ~~above-mentioned~~ input shaft 2 is connected to the above-mentioned drum~~-shaped member~~ 21, and ~~on~~ the inner circumferen~~ce side~~tial surface of this drum~~-shaped~~ member 21 is ~~configured in a~~ splined ~~manner~~ to the friction plates 71 of the clutch C1 which is ~~capable of engaging due to the oil pressure~~ operated by the hydraulic servo 11. ~~for the clutch C1, and is connected wherein~~ The ~~inner circumference side of the~~ friction plates 71 of ~~this~~ clutch C1 ~~is~~ are intermeshed with friction plates splined to the hub unit 22~~, Further, this hub unit 22~~ which is connected to the ~~above-mentioned~~ sun gear S2.

~~Further,~~ The ~~above-mentioned~~ drum~~-shaped member~~ 25 is rotatably supported by the ~~above-mentioned~~ boss ~~unit~~ 3a ~~so as to rotate,~~ and ~~on~~ the outer circumferen~~ce side~~tial surface of ~~the~~ a front portion ~~edge~~ of this drum~~-shaped member~~ 25 is splined ~~the~~ to friction plates 74 of the brake B1 which can be ~~retained~~ engaged by the ~~oil pressure~~ hydraulic servo 14 ~~for the above-mentioned brake B1. On~~ The inner circumferen~~ce side~~tial surface of the front ~~edge~~ portion of this drum~~-shaped member~~ 25 is ~~configured~~ splined to the friction plates 73 of the clutch C3 which is ~~capable of engaging~~ operated by the ~~oil pressure~~ hydraulic servo 13. ~~for the clutch C3, splined, and on the inner circumference side of the~~ The friction plates 73 ~~of this clutch C3~~ are intermeshed with friction plates splined to the ring gear R1. ~~is splined.~~

~~Further,~~ The carrier CR1 supports ~~has~~ a pinion Pa and a pinion Pb, ~~and this~~ pinion Pb meshes with the above-mentioned ring gear R1, and ~~this~~ pinion Pa meshes with the sun gear S1 which is ~~Is~~ connected to the input shaft 2. This carrier CR1 is secured to the boss ~~unit~~ 3a ~~of the case 3~~ via a side plate, and ~~this~~ ring gear R1 is supported by a supporting plate ~~unit~~ 26 which, in turn, is rotatably supported by ~~to~~ the boss ~~unit~~ 3a. ~~so as to rotate.~~

Further, ~~to~~ the above-mentioned drum ~~-shaped member~~ 25 receives, viz ~~is connected~~ a linking member (hereafter, also referred to as "transmitting member") 30, ~~that transmits~~ the rotation of the ring gear R1. ~~when the clutch C3 is engaged, and further, to the other side~~ At one end of this transmitting member 30 is connected the sun gear S3 of the first ~~above-mentioned~~ planetary gear unit PU.

~~On the other hand,~~ On the other side of the input shaft 2 (left in diagram) is ~~configured~~ a multi-disc clutch (second clutch) C2 that has an oil pressure servo 12, ~~a~~ friction plates 72, a ~~drum-shaped member 23 that forms a~~ clutch drum 23, and a hub unit 24 linked to a carrier CR2.

~~The~~ Oil chamber "a" of ~~this oil pressure~~ hydraulic servo 12 is connected to an oil line 2b which is formed on the above-mentioned input shaft 2, and this oil line 2b ~~is provided along the edge of the case 3 that is the opposite side of that of the above-mentioned boss unit 3a, and~~ is connected to the oil line 93 in ~~of~~ the boss ~~unit~~ 3b which is also formed as sleeve ~~provided on~~

around the input shaft 2. ~~in a sleeve form. Further,~~ This oil line 93 is connected to an oil pressure control unit, not illustrated. ~~In other words~~ Thus, an oil line from the oil pressure control unit, ~~not illustrated,~~ is connected to the oil chamber "a" of the oil pressure servo 12 ~~is configured,~~ simply by providing one set of seal rings 82 ~~to seal~~ between the input shaft 2 and the drum~~-shaped member~~ 23.

~~Further, to the above-mentioned input shaft 2, within the left side of the diagram, a drum-shaped member 23 is connected, and on~~ The inner circumferen~~ce side~~tial surface of ~~the~~ a front ~~edge~~ portion of ~~this~~ drum~~-shaped member~~ 23 is splined to the friction plates 72 of the clutch C2 which is ~~capable of engaging~~ operated by the ~~oil pressure~~ hydraulic servo 12. ~~for the clutch C2.~~ The ~~inner circumference side of the~~ friction plates 72 of this clutch C2 ~~is~~ are intermeshed with friction plates splined to the hub unit 24, and this hub unit 24 is connected to the side plate of the ~~above-mentioned~~ carrier CR2.

~~On the other hand, on the outer circumference side~~ Radially outward of the planetary gear unit PU is ~~configured~~ a multi-disc brake (second brake) B2 that has an oil pressure servo 15, ~~a~~ friction plates 75, and a hub unit 28. ~~So~~ The side plate of the carrier CR2 of this planetary gear unit PU is connected to a hub unit 28 to which ~~is~~ are splined the friction plates 75 of the above-mentioned brake B2. ~~and further,~~ This hub unit 28 is also connected to the inner race of a one-way clutch F1.

~~Further,~~ The ~~above-mentioned~~ ring gear R3 meshes with the long pinion PL of ~~this~~ carrier CR2, has one end connected to a linking member 27 ~~is connected to one edge of this ring gear R3~~, and ~~this ring gear R3~~ is linked to the counter gear 5 via this linking member 27.

As described above, the second planetary gear unit PR, the clutch C1 and the clutch C3 are located at ~~configured on~~ one ~~side in the~~ axial end ~~direction~~ of the first planetary gear unit PU, and ~~also~~ the clutch C2 ~~C1~~ is located ~~configured~~ on the opposite axial ~~one~~ side. ~~in the axial direction, and the clutch C2 is configured on the other side in the axial direction, and~~ The counter gear 5 is located ~~configured in~~ between the second planetary gear unit PR and the first planetary gear unit PU. Further, the clutch C1 is disposed radially inward ~~on the inner circumferential side~~ of the clutch C3, and, particularly, inward of a section of the transmitting member 30 that transmits the output thereof. Further, the brake B1 is located radially outward ~~configured on the outer circumference side~~ of the second planetary gear unit PR, and the brake B2 is located radially outward ~~configured on the outer circumference side~~ of the first planetary gear unit PU.

~~Continuing, based on the above-mentioned construction,~~ ~~the~~ Operations of ~~an~~ automatic transmission ~~device~~ 1_1 will now be described, with reference to Fig. 1, Fig. 2, and Fig. 3 below. ~~Now,~~ The vertical ax~~i~~es of the speed line diagram illustrated in Fig. 3 indicate the rotational speeds ~~revolutions~~ of each rota~~tion~~ry component, and the horizontal axis indicates the

corresponding gear ratio for ~~of~~ these rota~~tion~~ry components. ~~Further, regarding~~ In the planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the~~ right side of Fig. 3~~)~~s corresponds to sun gear S3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ~~axis~~ axes correspond~~s~~ to the carrier CR2, the ring gear R3, and the sun gear S2. Further, ~~regarding~~ in the planetary gear PR section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the~~ right side of Fig. 3~~)~~s corresponds to sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ~~axis~~ axes correspond~~s~~ to the ring gear R1 and the carrier CR1. Further, the widths between these vertical axes are inversely proportional to the ~~inverse of the~~ number of teeth of each of the sun gears S1, S2, S3, and to the ~~inverse of the~~ number of teeth of each of the ring gears R1, R3. ~~Also,~~ The dotted line ~~in the~~ horizontal ~~direction~~ within the diagram represents ~~illustrates that~~ the rotation ~~is~~ transmitted by ~~from~~ the transmitting member 30.

As illustrated in Fig. 1, the rotation of input shaft 2 is input to the ~~above-mentioned~~ sun gear S2, by engaging the clutch C1. The rotation of input shaft 2 is input to the above-mentioned carrier CR2, by engaging the clutch C2, and this carrier CR2 can be fixed against ~~the~~ rotation by engagement ~~the retaining~~ of brake B2, ~~and~~ further, the rotation in limited to ~~in~~ one direction ~~is~~

~~regulated~~ by the one-way clutch F1. ~~Further,~~ The sun gear S3 can be fixed against ~~the~~ rotation by engagement ~~the retaining~~ of the brake B1.

~~On the other hand,~~ The above-mentioned sun gear S1 is connected to the input shaft 2 so as to receive as input ~~and~~ the rotation thereof. ~~of this input shaft 2 is input, and further,~~ The carrier CR1 is fixed ~~connected~~ to the case 3 ~~and its rotation is fixed~~, and, therefore, the ring gear R1 rotates at a reduced speed ~~rotations~~. Further, by engaging the clutch C3, the reduced speed rotation~~s~~ of this ring gear R1 is input to the sun gear S3.

Also, the rotation of the ~~above-mentioned~~ ring gear R3 is output to the ~~above-mentioned~~ counter gear 5, and is output to the drive whee~~ls~~l via this counter gear 5, a counter shaft unit not illustrated, and a differential unit.

In ~~At~~ first speed forward within ~~a~~ D (drive) range, as illustrated in Fig. 2, the clutch C1 and the one-way clutch F1 are engaged. Then, as illustrated in Fig. 3, the rotation of input shaft 2 is input to the sun gear S2 via the clutch C1, and the rotation of the carrier CR2 is limited to ~~regulated in~~ one direction (the forward rotation direction). ~~In other words, the carrier CR2 is prevented from rotating in the opposite direction and becomes fixed~~. Further, the rotation of input shaft 2 that is input to the sun gear S2 is output to the ring gear R3 via the fixed carrier CR2, and the forward rotation for first speed forward is output from the counter gear 5. ~~Now,~~ When downshifting (~~when~~ coasting),

the brake B2 is ~~rotained~~ engaged and carrier CR2 is thereby fixed, and the above-~~mentioned~~ described state of first speed forward is maintained while preventing the forward rotation of ~~this~~ carrier CR2. ~~Further, at~~ In this first speed forward, because the one-way clutch F1 ~~prevents~~ of the carrier CR2 ~~from rotation in the opposite direction and~~ allows only forward rotation, ~~and therefore,~~ switching from a non-driving range to a driving range and achieving the first speed forward can be accomplished more smoothly by the automatic engaging of the one-way clutch.

~~At~~ In second speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C1 ~~is engaged~~ and the brake B1 ~~is retained~~ are engaged. Then, as illustrated in Fig. 3, the rotation of input shaft 2 is input to the sun gear S2 via the clutch C1, and the sun gear S3 is fixed by ~~rotaining~~ engagement of the brake B1. By doing so, the carrier CR2 rotates at a slightly reduced ~~rotation~~ speed, and the rotation of input shaft 2 that was input in the sun gear S2 is output to the ring gear R3 via the carrier CR2 at this reduced ~~rotation,~~ speed, and the forward rotation for second speed forward is output from the counter gear 5.

~~At~~ In third speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C1 and the clutch C3 are engaged. Then, as illustrated in Fig. 3, the rotation of input shaft 2 is input to the sun gear S2 via the clutch C1. Further, by the input of the rotation of the input shaft 2 ~~input~~ to the

sun gear S1 and the fixed state of carrier CR1, the ring gear R1 is rotated at a reduced ~~rotation~~ speed, and the ~~speed~~ reduc~~tion~~ed speed rotation of ~~this~~ ring gear R1 is output to the sun gear S3 via the clutch C3 and the transmitting member 30. ~~Then,~~ The carrier CR2 rotates at a speed ~~has a~~ slightly ~~greater~~ reduced as ~~rotation~~ compared to that of ~~the reduced rotation of this~~ sun gear S3 because of the rotation of the input shaft 2 input to the sun gear S2 and the reduced speed ~~rotation~~ of the sun gear S3. Further, the rotation of input shaft 2 that is ~~was~~ input to ~~in~~ the sun gear S2 is output to the ring gear R3 via the carrier CR2 at this reduced speed ~~rotation~~, and the forward rotation for third speed forward is output from the counter gear 5. In this case, because the sun gear S3 and the ring gear R1 are rotating at a reduced speed ~~rotation~~, the above-mentioned transmitting member 30 transmits ~~performs~~ a relatively large torque. ~~transmission.~~

In ~~At~~ fourth speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C1 and the clutch C2 are engaged. Then, as illustrated in Fig. 3, the rotation of input shaft 2 is input to the sun gear S2 via the clutch C1, and into the carrier CR2 via the clutch C2. Therefore, by input of the rotation of the input shaft 2 ~~input~~ to the sun gear S2 and the rotation of input shaft ~~shat~~ 2 input to the carrier CR2, ~~in other words, in the~~ a state of directly coupled rotation is established wherein the rotation of the input shaft 2 is output as is ~~in~~to the ring gear R3, and the forward rotation for fourth speed

forward is output from the counter gear 5.

In ~~At~~ fifth speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C2 and the clutch C3 are engaged. Then, as illustrated in Fig. 3, the rotation of input shaft 2 is input to the carrier CR2 via the clutch C2. Further, by input of the rotation of the input shaft 2 ~~input~~ to the sun gear S1 and the fixed state of carrier CR1, the ring gear R1 rotates at a reduced ~~rotation~~ speed, and the ~~speed~~ reduc~~tion~~ed speed rotation of this ring gear R1 is output to the sun gear S3 via the clutch C3 and the above-mentioned transmitting member 30. ~~Then, the~~ Overdrive rotation is output to the ring gear R3 from the ~~reduced rotation of the~~ sun gear S3 and the carrier CR2 ~~wherein the rotation of the input shaft 2 is input~~, and the forward rotation for fifth speed forward is output from the counter gear 5. In this case, similar to the case of ~~the~~ above-mentioned third speed forward, due to rotation of the sun gear S3 and the ring gear R1 ~~being~~ at a reduced speed ~~rotation~~, the above-mentioned transmitting member 30 transmits ~~performs~~ a relatively large torque. ~~transmission.~~

In ~~At~~ sixth speed forward within the D (drive) range, as illustrated in Fig. 2, the clutch C2 ~~is engaged~~ and the brake B1 are engaged ~~is retained~~. Then, as illustrated in Fig. 3, the rotation of the input shaft 2 is input to the carrier CR2 via the clutch C2, and the sun gear S3 is fixed by engagement of ~~retaining~~ the brake B2. This produces ~~causes an~~ overdrive rotation ~~(even~~

(greater than that of the above-mentioned fifth speed forward), from the rotation of the input shaft 2 input to the carrier CR2 and the fixed state of sun gear S3, ~~and~~ which overdrive rotation is output to the ring gear R3, and the forward rotation for sixth speed forward is output from the counter gear 5.

~~At the~~ In first speed reverse within an R (reverse) range, as illustrated in Fig. 2, the clutch C3 ~~is engaged~~ and the brake B2 ~~is retained~~ are engaged. Then, as illustrated in Fig. 3, the ring gear R1 rotates at reduced speed based on ~~rotations from~~ the rotation of input shaft 2 input to the sun gear S1 and the fixed state of carrier CR1, and the reduced ~~rotation~~ speed of this ring gear R1 ~~this reduced rotation~~ is output to the sun gear S3 via the clutch C3 and the above-mentioned transmitting member 30. Further, the carrier CR2 is fixed by ~~retaining~~ engaging the brake B2. Then, the reduced speed rotation of the sun gear S3, ~~and the fixed~~ with fixed, carrier CR2 is output to the ring gear R3 as ~~an opposite~~ reverse ~~direction rotation, and the opposite direction~~ rotation ~~for~~ and is output as first speed reverse ~~is output~~ from the counter gear 5. In this case, similar to the case of the above-mentioned third speed forward or fifth speed forward, since the sun gear S3 and the ring gear R1 are rotating at a reduced ~~rotation~~ speed, the above-mentioned transmitting member 30 ~~performs~~ transmits a relatively large torque ~~transmission~~.

~~At~~ In the P (parking) range and the N (neutral) range, ~~particularly~~ clutch C1, clutch C2, and clutch C3 are

released, the ~~transmission movement between the~~ input shaft 2 ~~and~~ the counter gear 5 is disconnected~~,~~ from and the automatic transmission ~~device~~ 1_1 as a whole is in an idle state (neutral state).

As described above, ~~according to~~ in the automatic transmission device 1_1 ~~relating to~~ of the present invention, due to the location of the second planetary gear unit PR and the clutch C1 ~~being configured~~ on one side ~~in the~~ axial ~~direction~~ of the first planetary gear unit PU, and the clutch C2 being located ~~configured~~ on the other side ~~in the~~ axial ~~direction~~ of the planetary gear unit PU, the second planetary gear unit PR and the first planetary gear unit PU can be arranged more ~~configured~~ closely together, as compared to the case wherein for example two clutches C1 and C2 are located ~~configured in~~ between the second planetary gear unit PR and the first planetary gear unit PU, and the transmitting member 30 for transmitting reduced speed rotation can be relatively shorter~~ned~~. In this manner ~~By doing so~~, the automatic transmission can be made more compact and ~~more~~ lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are located ~~configured~~ on one side of the first planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 92, 93), that supply the hydraulic ~~oil pressure~~ servos 11, 12, and 13 of these clutches C1, C2,

C3, ~~can be~~ are constructed more easily, ~~and~~ the manufacturing process ~~can be~~ is simplified and the costs ~~brought down~~ is reduced.

Further, due to the oil pressure servos 11 and 12 being provided on the input shaft 2, one set of seal rings 81 and 82 serves to form a connection with ~~seal the case 3 and supply oil to~~ the oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chamber "a" of the ~~oil pressure~~ hydraulic servos 11 and 12 without providing seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Further, the ~~oil pressure~~ hydraulic servo 13 can receive a supply of oil directly from the boss ~~unit~~ 3a, i.e. ~~provided from the case 3,~~ without passing through other units, merely ~~for example, in other words, can supply oil~~ by providing one set of seal rings 80. Therefore, ~~oil~~ the hydraulic servos can be connected to the oil supply ~~supplied~~ simply by providing one set of seal rings 81 and 82, 80 each for each of the oil pressure servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, since the clutch C1 is ~~configured on the inner circumference side~~ located radially inward of the clutch C3, the clutch C3, which must transmit a relatively large torque in order to transmit the reduced speed rotation, can be ~~configured on~~ located at the outer ~~circumference~~ side~~,~~ and therefore this clutch C3 ~~and the oil pressure~~ its hydraulic servo operator 13 ~~thereof~~ can have an increased diameter. ~~Particularly~~ Thus, the pressure receiving area of the oil chamber "a" of the

hydraulic ~~oil pressure~~ servo 13 can be enlarged, and the ~~capacity capable of~~ torque transmission capacity of this clutch C3 can be increased. By ~~configuring~~ designing the clutch C1 ~~which can~~ to have a smaller ~~capacity for~~ torque transmission capacity as compared to the clutch C3, the automatic transmission can be made more compact.

Further, because the counter gear 5 is ~~configured in the~~ located axially ~~direction~~ between the first planetary gear unit PU and the second planetary gear unit PR, the counter gear 5 can be ~~configured~~ located in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. Thus, for example, when the automatic transmission is mounted on the vehicle, enlargement ~~enlarging~~ toward~~s~~ ~~one direction of the axis (particularly in~~ the rear ~~direction~~ when the ~~input~~ side which receives input from the drive source is the front ~~direction)~~ ~~can be prevented~~ is not necessary because the counter gear 5 is mounted to ~~match~~ mate with the drive wheel transmission device. Because of this, particularly in the case of a~~n~~ FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, and the ~~mountability on a vehicle can be improved, such as the~~ steering angle can be~~ing~~ greatly increased, for example.

~~Further,~~ The automatic transmission ~~device~~ 1_1 ~~according to~~ of the ~~present~~ first embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, at fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a higher ratio~~s~~, and ~~particularly~~ when

~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine speed ~~revolutions~~ can be relatively lower~~ed~~, which allows ~~and this contributes to the quietness of~~ the vehicle to ~~while~~ run~~ning~~ more quietly at a high speed.

Second Embodiment

A second embodiment, which is a partial modification of the first embodiment, will now be described, with reference to Fig. 4 which shows ~~. Fig. 4 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the second embodiment~~.

~~Now,~~ Components of the second embodiment that are the same as those of the first embodiment are ~~will be~~ denoted by ~~with~~ the same reference numerals, and description thereof omitted, except for those components partially modified ~~modifications~~.

~~As Fig. 4 illustrates, the~~ an automatic transmission ~~device~~ 1_2 as having its ~~of the automatic transmission relating to the second embodiment has the~~ input ~~side~~ and output sides reversed ~~backwards~~ from ~~that of~~ the automatic transmission ~~device~~ 1_1 ~~of the automatic transmission~~ of the first embodiment. Further, the operations of the ~~actions of~~ the first ~~speed forward~~ through ~~the~~ sixth speeds forward and the first speed reverse of I_2 of the second embodiment are similar to those of the automatic transmission I_1 of the first embodiment ~~is similar~~ (see Fig. 2 and Fig. 3).

As with ~~Similar to~~ the first embodiment, in this second embodiment ~~according to the automatic transmission device 1_2 relating to the present invention~~, due to the planetary gear PR and the clutch C1

being ~~configured~~ located on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 being ~~configured~~ located on the other axial side ~~in the axial direction~~ of the first planetary gear unit PU, the second planetary gear unit PR and the first planetary gear unit PU can be ~~configured~~ placed more closely together, as compared to the case wherein, for example, The two clutches C1 and C2 are ~~configured in~~ located between the second planetary gear unit PR and the first planetary gear unit PU~~, so~~ Thus, the transmitting member 30 ~~for~~ which transmits~~ting~~ the reduced speed rotation can be relatively shorte~~ned~~r. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (initerial force) ~~of inertia)~~ can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case where~~in~~ three clutches C1, C2, C3 are ~~configured~~ located on one side of the first planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 92, 93) that supply the ~~oil pressure~~ hydraulic servos 11, 12, and 13 of these clutches C1, C2, C3 can be more constructed easily, ~~and~~ the manufacturing process can be simplified and the costs brought down.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ mounted on the input shaft 2, one set of seal rings 81 and 82 serves to seal the case 3 and ~~supply oil to~~ to establish a connection with the oil lines 2a and 2b ~~provided~~ within input shaft 2, and therefore oil can be supplied to the oil chambers "a" of the ~~oil pressure~~ hydraulic servos

11 and 12 without providing seal rings between, for example, the input shaft 2 and the hydraulic ~~oil pressure~~ servos 11 and 12. Further, hydraulic ~~oil pressure~~ servo 13 can receive supply of oil directly from the boss unit 3a, i.e. ~~provided from the case 3,~~ without that supply passing through other units, for example, ~~in other words, can supply oil~~ by provision of ~~providing~~ one set of seal rings 80. Therefore, oil supply can be connected ~~supplied simply~~ by provision of ~~providing~~ one set of seal rings 81 and 82, 80, respectively, each for of the hydraulic ~~oil pressure~~ servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and accordingly, the efficiency of the automatic transmission can be improved.

As in the first embodiment ~~Further~~, ~~due to~~ because the clutch C1 is located radially inward ~~being configured on the inner circumference side~~ of the clutch C3, the clutch C3, which must transmit a relatively large torque in order to transmit the reduced speed rotation, can be arranged at ~~configured on~~ the outer circumference. ~~side, and~~ Therefore, this clutch C3 and its ~~the oil~~ pressure servo 13 ~~thereof~~ can have an increased diameter, ~~Particularly,~~ the pressure receiving area of its ~~the~~ oil chamber ~~of the oil pressure servo 13~~ can be enlarged, and its ~~the capacity capable of~~ torque transmission capacity ~~of this clutch C3~~ can be increased. Again, by ~~configuring~~ designing the clutch C1 ~~which can~~ to have a smaller torque transmission capacity ~~for~~ as compared to the clutch C3, the automatic transmission can be made more compact.

Further, because the counter gear 5 is located ~~configured in~~

~~the~~ axially ~~direction~~ between the first planetary gear unit PU and the second planetary gear unit PR, the counter gear 5 can be located ~~configured~~ in approximately the axial center ~~in the axial direction~~ of the automatic transmission. With this second embodiment also ~~For example~~, ~~when the automatic transmission is mounted on the vehicle,~~ enlargement ~~ing~~ toward~~s~~ ~~one direction of the axis (particularly in~~ the rear ~~direction~~ (when the end which receives input ~~side~~ from the drive source is the "front" ~~direction~~) is not necessary ~~can be prevented~~ because the counter gear 5 is mounted to mate with ~~match~~ the drive wheel transmission device. Because of this, particularly in the case of a~~n~~ FF vehicle, ~~the~~ interference with ~~toward~~ the front wheels is reduced, ~~and the~~ mountability on a vehicle is ~~can be~~ improved, and ~~such as~~ the steering angle is ~~being~~ greatly increased. ~~for example.~~

Further, the automatic transmission ~~device 1 2~~ 1_2 according to the second ~~present~~ embodiment ~~is a transmission device that~~ is directly coupled in ~~at~~ fourth speed forward. Therefore, at fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and when ~~particularly when mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine speed ~~revolutions~~ can be relatively less ~~lowered~~, Thus allowing the ~~and this contributes to the quietness of the~~ vehicle to ~~while~~ run more quietly ~~ning~~ at a high speed.

[Third Embodiment]

A third embodiment, which is a partial modification of ~~partially modified from~~ the first embodiment, will now be described, with reference to Fig. 5

through Fig. 7 ~~Fig. 5 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the third embodiment, Fig. 6 is an operational table of an automatic transmission relating to the third embodiment, and Fig. 7 is a speed line diagram of an automatic transmission relating to the third embodiment. Now,~~ Components of the third embodiment that are the same as the first embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for those components partial modifi~~cations~~ed.

As ~~Fig. 5 illustrates,~~ shown in Fig. 5, the automatic transmission ~~device~~ 1_3 of the ~~automatic transmission relating to the~~ third embodiment is ~~a~~ modifi~~cation of~~ed with respect to the configuration of the second planetary gear unit PR and the clutch C3, ~~from that of the~~ as compared to the automatic transmission ~~device~~ 1_1 of the automatic transmission of the first embodiment (see Fig. 1).

In ~~The~~ the clutch C3 is ~~configured~~ located on the planetary gear unit PU side (left side of diagram) of the second planetary gear unit PR. ~~within~~ this automatic transmission device 1_3. The inner circumference ~~side~~ flat surface of ~~the~~ a front ~~edge~~ portion of the drum ~~shaped member~~ 25 of ~~this~~ clutch C3 is splined to the friction plates 73, ~~and the inner circumference side of this~~ which are intermeshed with friction plates ~~73 is~~ splined to the hub unit 26. Further, the drum ~~shaped member~~ 25 is connected to the input shaft 2, and the hub unit 26 is connected to the sun gear S1.

3rd Embod
Fig. 4

~~Further,~~ The side plate of the carrier CR1 is fixed to and supported by the case 3. Also, the ring gear R1 is connected to the transmitting member 30, and the outer circumferen~~ce side~~tial surface of ~~this~~ the transmitting member 30 is splined to the friction plates 74 of the brake B1, and this transmitting member 30 is connected to the sun gear S3.

The oil chamber of ~~this oil pressure~~ hydraulic servo 13 for the clutch C3 is connected to an oil line 2c which is formed ~~with a double structure~~ in parallel with oil line 2a on the ~~above-mentioned~~ input shaft 2, and this oil line 2c is connected to the oil line 92 of the boss ~~unit~~ 3a ~~of the case 3.~~ ~~Further, this oil line 92~~ which, in turn, is connected to an oil pressure control unit, not illustrated. In other words, ~~due to the above-mentioned oil pressure~~ because the hydraulic servos 11 and ~~the oil pressure servo 13 being configured~~ 13 are mounted on input shaft 2, ~~an~~ oil ~~line~~ supply from the oil pressure control unit, not illustrated, to their oil chambers ~~of the oil pressure servo 11 and the oil pressure servo 13 is configured,~~ can be connected simply by providing seal rings 81 ~~to seal~~ between the boss ~~unit~~ 3a of ~~the case 3~~ and the input shaft 2.

~~Continuing, based on the above-described construction,~~ ~~the~~ Operations of the automatic transmission ~~device~~ 1_3 of the third embodiment will now be described below, with reference to Fig. 5, Fig. 6, and Fig. 7. ~~Now,~~ Similar to the ~~above~~ first embodiment, the vertical axes of the speed line diagram ~~illustrated~~ in Fig.

7 indicate the speed ~~revolutions~~ of each rota~~tion~~ r component, and the horizontal axis indicates the corresponding gear ratio of the~~se~~ir rota~~tion~~ry components. ~~Further, regarding~~ In the planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the~~ right side of Fig. 7~~)~~ corresponds to the sun gear S3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical axes ~~axis~~ correspond~~s~~ to the carrier CR2, the ring gear R3, and the sun gear S2. ~~Further, regarding~~ In the planetary gear unit PR section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the~~ right side of Fig. 7~~)~~ corresponds to the sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical axes ~~axis~~ correspond~~s~~ to the ring gear R1 and the carrier CR1. Further, the widths between these vertical axes are inversely proportional to the ~~inverse of the~~ number of teeth of each of the sun gears S1, S2, S3, and to the ~~inverse of the~~ number of teeth of each of the ring gears R1, R3. Also, the horizontal dotted line ~~in the~~ ~~direction~~ in the diagram represents ~~illustrate that~~ the rotation ~~is~~ transmitted by ~~from~~ the transmitting member 30.

As Fig. 5 illustrates, the rotation of input shaft 2 is input to the ~~above-mentioned~~ sun gear S1 by engaging the clutch C3. Further, the ~~rotation of the above-mentioned~~ carrier CR1 is fixed ~~as~~ to the case 3, and the ~~above-~~

~~mentioned~~ ring gear R1 rotates at a reduced speed ~~rotations~~ based on the rotation of input shaft 2 which is input to ~~this~~ sun gear S1. In other words, by engaging the clutch C3 the reduced speed rotation of the ring gear R1 is input to the sun gear S3 via the transmitting member 30.

In this manner ~~By doing so~~, as illustrated in Fig. 6 and Fig. 7 ~~illustrate~~, regarding the second planetary gear unit PR, in ~~at~~ third speed forward, fifth speed forward, and first speed reverse, the rotation of the input shaft 2 is input to the sun gear S1 by engaging the clutch C3, and the reduced speed rotation is output to the ring gear R3 through ~~by~~ the fixed carrier CR1, ~~and the reduced rotation is input~~ to the sun gear S3 via the transmitting member 30. In this case, because the ring gear R1 and the sun gear S3 are rotating at a reduced speed, the ~~therefore the above-mentioned~~ transmitting member 30 transmits ~~performs~~ a relatively large torque. ~~transmission.~~ On the other hand, in ~~at~~ first speed forward, second speed forward, fourth speed forward, and sixth speed forward, the rotation of the sun gear S3 is input to the ring gear R1 via the transmitting member 30, and further, because the clutch C3 is released, as Fig. 7 illustrates, the sun gear S1 rotates based on ~~each~~ the rotation ~~within the speed level~~ state of ~~this~~ ring gear R1 and the fixed carrier CR1.

The operations ~~Now, the actions~~ other than those described above for ~~of~~ the ~~above-~~ second ~~mentioned~~ planetary gear unit PR are similar to those ~~of the~~ previously ~~above~~ described for the first embodiment (see Fig. 2 and Fig. 3),

and accordingly description thereof will be omitted here.

As described above, in ~~according to~~ the automatic transmission ~~device~~ 1_3 of this third embodiment ~~relating to the present invention~~, due to the second planetary gear unit PR and the clutch C1 being located ~~configured~~ on one axial side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 being located ~~configured~~ on the other side ~~in the axial direction~~ of the first planetary gear unit PU, the second planetary gear unit PR and the first planetary gear unit PU can be placed more ~~configured~~ closely together, compared to the case wherein, for example, two clutches C1 and C2 are located ~~configured in~~ between the second planetary gear unit PR and the first planetary gear unit PU, and therefore the transmitting member 30 ~~for transmitting reduced rotation~~ can be made relatively shorte~~ned~~r. In this manner ~~By doing so~~, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force of inertia) is ~~can be~~ reduced, the controllability of the automatic transmission is ~~can be~~ increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are located ~~configured~~ on one side of the first planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 92, 93) that supply the hydraulic ~~oil pressure~~ servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed more easily, ~~and~~ the manufacturing process can be simplified and the costs can be reduced ~~brought down~~.

Further, due to mounting the oil pressure servos 11, 12, and 13

~~are provided~~ on the input shaft 2, the seal rings 81 and 82 can seal the ~~case 3 and supply oil to~~ bosses 3a and 3b to the input shaft 2 to connect the oil lines 2a and 2b, 2c provided within input shaft 2~~, and therefore oil can be supplied~~ to the oil chambers of ~~oil pressure~~ hydraulic servos 11, 12, and 13 without providing the seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11, 12, and 13. Therefore, the oil ~~can be~~ ~~supplied~~ can be connected simply by providing the seal rings 81 and 82 each for the ~~oil pressure~~ hydraulic servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, because the counter gear 5 is ~~configured in the axial direction~~ located between the first planetary gear unit PU and the second planetary gear unit PR, the counter gear 5 can be ~~configured~~ located in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, ~~when the automatic transmission is mounted on the vehicle,~~ enlarg~~ing~~ement towards ~~one direction of the axis (particularly in~~ the rear ~~direction~~ (when the input side ~~from~~ facing the drive source is the front ~~direction~~) ~~can be prevented~~ is not necessary because the counter gear 5 is mounted to ~~match~~ mate with the drive wheel transmission device. Because of this, particularly in the case of an FF vehicle, the interference ~~toward~~ with the front wheels is reduced, ~~and~~ the mountability on a vehicle can be improved, ~~such as~~ and the steering angle can be being greatly increased, for example.

~~Further, in the event that~~ In transmissions where the clutch C3 is placed between the ring gear R1 and the sun gear S3 for example, the clutch C3 the high torque, speed reduced rotation must ~~be~~ engaged and disengaged, and therefore must be ~~becomes~~ relatively large. However, in the present invention, ~~but~~ by placing clutch C3 between the input shaft 2 and the sun gear S1, the engaging and disengaging of the clutch C3 controls transfer of the rotation of the input shaft 2 to the sun gear and thereby indirectly ~~from this clutch C3 causes~~ controls output of the reduced speed rotation ~~output~~ from the ring gear R1. ~~of the planetary gear PR is to be engaged and disengaged, and~~ Therefore, the clutch C3 can be made more compact, and therefore the automatic transmission can be made more compact.

Further, the automatic transmission ~~device~~ 1_3 according to ~~the present~~ this third embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and ~~particularly when mounted on a vehicle,~~ in the event that the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be lowered, ~~and this contributes to the quietness of~~ thus allowing the vehicle ~~while~~ to run more quietly at a high speed.

Fourth Embodiment

~~Below,~~ The fourth embodiment, which is a partial modification of the first embodiment, will now be described with reference to Fig. 8 through Fig. 10. ~~Fig. 8 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to~~

~~the fourth embodiment, Fig. 9 is an operational table of an automatic transmission relating to the fourth embodiment, and Fig. 10 is a speed line diagram of an automatic transmission relating to the fourth embodiment. Now,~~ Components of the fourth embodiment which are the same as those of the first embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for partially modifi~~cations~~ed components.

As Fig. 8 illustrates, the automatic transmission ~~device~~ 1_4 of the ~~automatic transmission relating to the~~ fourth embodiment ~~comprises~~ has a brake (third brake) B3 instead of the clutch C3, and the carrier CR1 of the planetary gear PR is can be fixed by the brake B3. ~~in comparison with that of the automatic transmission device 1_1 of the automatic transmission of the first embodiment (see Fig. 1)~~.

The brake B3 is ~~configured~~ located on the ~~opposite~~ side of the second planetary gear unit ~~PU~~ PR (right side of diagram) opposite ~~of~~ the first planetary gear ~~PR~~ unit PU. ~~within this automatic transmission device 1_1.~~ This brake B3 has ~~an oil pressure~~ a hydraulic servo 16, ~~a~~ friction plates 76, and a hub unit 33.

The hub unit 33 of this brake B3 is connected ~~on~~ to one side plate of the carrier CR1, and this carrier CR1 is rotatably supported by the boss ~~unit~~ 3a or the input shaft 2. ~~so as to be capable of rotation. Further,~~ The sun gear S1 is connected to the input shaft 2 ~~. Further,~~ and the friction plates

74 of the brake B1 ~~is~~ are splined to the outer circumferen~~ce~~tial surface ~~side~~ of the ring gear R1. This ring gear R1 is connected to ~~the transmitting member 30, and~~ the sun gear S3 ~~is connected~~ via ~~this~~ transmitting member 30.

~~Continuing, based on the above-mentioned construction, the~~ Operations of ~~an~~ the automatic transmission ~~device~~ 1_4 of the fourth embodiment will now be described below with reference to Fig. 8, Fig. 9, and Fig. 10. ~~below. Now,~~ As with the above-~~mentioned~~ described first embodiment, the vertical ~~axis~~ axes of the speed line diagram illustrated in Fig. 10 indicate the ~~revolutions~~ speeds of ~~each~~ the various rota~~tion~~ry components, and the horizontal axis indicates the corresponding gear ratios of these rota~~tion~~ry components. ~~Further,~~ Regarding the first planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the~~ right side of Fig. 10~~)~~ corresponds to sun gear S3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ~~axis~~ axes correspond~~s~~ to the carrier CR2, the ring gear R2, and the sun gear S2. ~~Further,~~ Regarding the second planetary gear unit PR section of this speed line diagram, the vertical axis to the farthest ~~horizontal edge (the~~ right side of Fig. 10~~)~~ corresponds to sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ~~axis~~ axes correspond~~s~~ to the ring gear R1 and the carrier CR1. Further, the widths between these vertical axes are inversely proportional to the ~~inverse of the~~ number of teeth of each

of the sun gears S1, S2, S3, and to ~~the inverse of~~ the number of teeth of each of the ring gears R1, R3. Also, the dotted line ~~in the~~ horizontal ~~direction~~ in the diagram represents ~~illustrate that~~ the rotation ~~is~~ transmitted by ~~from~~ the transmitting member 30.

As Fig. 8 illustrates, the ~~above-mentioned~~ carrier CR1 is fixed to the case 3 by engagement of ~~retaining with~~ the brake B3, whereby ~~Further,~~ the rotation of the input shaft 2 is input to the sun gear S1, and the ~~above-mentioned~~ ring gear R1 rotates at reduced speed ~~rotations~~, based on the rotation of input shaft 2 ~~which is~~ input to the ~~this~~ sun gear S1 and the braking of ~~because~~ the carrier CR1. ~~is fixed. In other words,~~ By engaging the brake B3, the reduced speed rotation of the ring gear R1 is also input to the sun gear S3 via the transmitting member 30.

~~By doing so,~~ As Fig. 9 and Fig. 10 illustrate, in ~~regarding~~ the planetary gear PR in ~~at~~ third speed forward, fifth speed forward, and first speed reverse, the rotation of the input shaft 2 is input to the sun gear S1 by engagement of ~~retaining with~~ the brake B3 to fix the carrier CR1 ~~is fixed~~, and the reduced speed rotation is output to the ring gear R3 by the input of rotation to ~~of~~ the sun gear S1 from ~~wherein the rotation of~~ the input shaft 2 ~~is input~~, and this reduced speed rotation is input to the sun gear S3 via the transmitting member 30. In this case, the ring gear R1 and the sun gear S3 are rotating at reduced speed, and therefore the ~~above-mentioned~~

transmitting member 30 transmits ~~performs~~ a relatively large torque. ~~transmission.~~ On the other hand, in ~~at~~ first speed forward, second speed forward, fourth speed forward, and sixth speed forward, the rotation of the sun gear S3 is input to the ring gear R1 via the transmitting member 30, and further, because the brake B3 is released, as Fig. 10 illustrates, the carrier CR1 rotates at a speed based on ~~each the rotation within~~ the speed of ~~level of this~~ ring gear R1 and of the sun gear S1, ~~of the rotation of the input shaft 2.~~

~~Now,~~ The operations of the third embodiment, ~~actions~~ other than those of the ~~above-~~ above mentioned planetary gear unit PR are similar to those of the above-described first embodiment (see Fig. 2 and Fig. 3), and, accordingly, description thereof will be omitted.

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_3 of ~~relating to~~ the third embodiment ~~present invention~~, due to the planetary gear PR and the clutch C1 being located ~~configured~~ on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 being ~~configured~~ on its ~~the~~ other side ~~in the axial direction of the planetary gear unit PU~~, the second planetary gear unit PR and the first planetary gear unit PU can be located more ~~configured~~ closely together, as compared to the case wherein, for example, two clutches C1 and C2 are located ~~configured in~~ between the second planetary gear unit PR and the first planetary gear unit PU, and the transmitting member 30 ~~for~~ which transmits ~~transmitting~~ the reduced speed rotation can be made relatively shorter ~~shortened~~.

By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ mounted on the input shaft 2, the seal rings 81 and 82 form seals between the case 3 and ~~supply oil to~~ the oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chambers of ~~oil pressure~~ hydraulic servos 11 and 12 without providing seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Therefore, the supply oil can be ~~supplied~~ connected simply by providing ~~the~~ seal rings 81 and 82 each for of the ~~oil pressure~~ hydraulic servos 11 and 12, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, because the counter gear 5 is ~~configured in~~ located ~~the~~ axially ~~direction~~ between the planetary gear unit PU and the planetary gear unit PR, the counter gear 5 can be ~~configured~~ located in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. ~~For example~~ Thus, ~~when the automatic transmission is mounted on the vehicle,~~ enlarg~~ing~~ement towards ~~one direction of the axis (particularly in~~ the rear ~~direction~~ (when the ~~input~~ side which receives input from the drive source is the

" front " ~~direction~~) is not necessary ~~can be prevented~~ because the counter gear 5 is mounted to mate with ~~match~~ the drive wheel transmission device. Because of this, particularly in the case of ~~an~~ FF vehicle, ~~the~~ interference with ~~toward~~ the front wheels is reduced, ~~and the~~ mountability on a vehicle is ~~can be~~ improved, and ~~such as~~ the steering angle is ~~being~~ greatly increased, for example.

Further, because the reduced speed rotation output to the first planetary gear unit PU from the second planetary gear unit PR is controlled by selective ~~engaged~~ ~~and~~ ~~dis~~engagement of ~~by~~ the brake B3, the number of parts (for example, drum-shaped members and so forth) can be reduced as compared to the case wherein, for example, a clutch C3 is provided. Further, the brake B3 can receive ~~configure an~~ oil supply ~~line~~ directly from the case 3, and therefore the configuration of the oil line can be simplified as compared to embodiments having ~~the case~~ ~~wherein, for example,~~ a clutch C3. ~~is provided.~~

~~Further,~~ The automatic transmission ~~device~~ 1_4 according to this fourth ~~the present~~ embodiment is ~~a transmission device that is~~ directly coupled in ~~at~~ fourth speed forward. Therefore, in ~~at~~ fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine speed ~~revolutions~~ can be lowered, thus allowing ~~and this contributes to the quietness of~~ the vehicle to ~~while~~ run more quietly ~~ning~~ at ~~a~~ high speed.

"Fifth Embodiment"

~~Below,~~ The fifth embodiment, which is a partial modification of the first embodiment, will be described below with reference to Fig. 11~~. Fig. 11 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the fifth embodiment. Now, the fifth embodiment will be described~~ in an abbreviated manner, using the same reference numerals for components ~~parts~~ that are the same as in the first embodiment~~, except for partial modifications~~.

As Fig. 11 illustrates, the automatic transmission ~~device~~ 1_5 of the ~~automatic transmission relating to the third~~ fifth embodiment has ~~is a modification of~~ the configuration of the planetary gear PR and the clutch C3 modified relative to ~~from that of~~ the automatic transmission ~~device~~ 1_1 of the ~~automatic transmission of the~~ first embodiment (see Fig. 1), and further, a brake B3 is provided to fix the ~~configured, and the~~ carrier CR1 of the second planetary gear unit PR ~~can be fixed by the brake B3.~~

In this fifth embodiment the clutch C3 is located ~~configured~~ on the first planetary gear unit PU side (left side of diagram) of the second planetary gear unit PR ~~within this automatic transmission device 1_5~~, and the brake B3 is ~~configured~~ on the other side of the second planetary gear unit PR ~~on the opposite side from~~ the first planetary gear unit PU. The inner circumferential surface ~~circumference side~~ of a ~~the~~ front portion ~~edge~~ of the drum ~~shaped member~~ 25 of ~~this~~ clutch C3 is splined to the friction plates 73, which are intermeshed with ~~and the inner circumference side of this~~ friction plates

74 ~~is~~ are splined to the hub unit 26. Further, the drum ~~shaped member~~ 25 is connected to the input shaft 2, and the hub unit 26 is connected to the sun gear S1.

The brake B3 is ~~configured~~ on the ~~opposite~~ side of the second planetary gear unit ~~P2~~ PR (right side of diagram) opposite ~~of~~ the first planetary gear unit PU ~~G1~~. This brake B3 comprises a hydraulic ~~an oil pressure~~ servo 16, a ~~a~~ friction plates 76, and a hub unit 33. The friction plates 76 are ~~is~~ splined to ~~on~~ the outer circumferential surface ~~ce side~~ of the hub unit 33 ~~of this brake B3~~, and the hub unit 33 is connected to one side plate of the carrier CR1. ~~and this~~ Carrier CR1 is rotatably supported by the input shaft 2 or the boss ~~unit~~ 3a, ~~so as to rotate~~. ~~Also,~~ The friction plates 74 of the brake B1 are ~~is~~ splined to ~~on~~ the outer circumferential surface ~~ce side~~ of the ring gear R1, and this ring gear R1 is connected to the ~~transmitting member 30, and the~~ sun gear S3 ~~is connected~~ via ~~this~~ transmitting member 30.

The oil chamber of hydraulic ~~this oil pressure~~ servo 13 for the clutch C3 is connected to an oil line 2c which is formed ~~as a doubled construction~~ in parallel with oil line 2a on the above-mentioned input shaft 2, and this oil line 2c is connected to the oil line 92 of the boss ~~unit~~ 3a of the case 3. Further, this oil line 92 is connected to an oil pressure control unit, not illustrated. In other words, because the ~~above-mentioned oil pressure~~ hydraulic servos 11 and ~~the oil pressure servo~~ 13 are mounted ~~configured~~ on input shaft 2, an oil line from

the oil pressure control unit, not illustrated, is connected to the oil chambers of the ~~oil pressure~~ hydraulic servos 11 and 13 ~~the oil pressure servo 13 is configured,~~ simply by providing seal rings 81 ~~to seal~~ between the boss ~~unit~~ 3a ~~of the case 3~~ and the input shaft 2.

~~Continuing, based on the above-mentioned construction, the~~ Operations of the automatic transmission ~~device~~ 1_5 of the fifth embodiment will now be described below, with reference to Fig. 11, ~~Fig. 2, and Fig. 3 below. Now, the present~~ and, because the fifth embodiment is similar to the first embodiment, ~~and therefore will be described based on~~ with reference to the engagement chart and the speed line diagram ~~described in~~ for the first embodiment (see Fig. 2 and Fig. 3).

As Fig. 11 illustrates, the rotation of input shaft 2 is input to the ~~above-mentioned~~ sun gear S1 by engaging the clutch C3. Further, the ~~rotation of the above-mentioned~~ carrier CR1 is fixed to the case ~~3~~ by engagement of the brake B3. ~~retaining.~~ Therefore, upon engagement of the clutch C3 ~~engaging~~ and the brake B3 ~~retaining~~, the ~~above-mentioned~~ ring gear R1 will rotate ~~s~~ at a reduced ~~rotations~~ speed based on the rotation of input shaft 2 which is input to ~~this~~ sun gear S1. In other words, by engaging the clutch C3 and ~~retaining~~ the brake B3, the reduced speed rotation of the ring gear R1 is input to the sun gear S3 via the transmitting member 30.

By doing so, as Fig. 2 and Fig. 3 illustrate, regarding the planetary gear PR, ~~at~~ in third speed forward, fifth speed

forward, and first speed reverse, the rotation of the input shaft 2 is input to the sun gear S1 by engaging the clutch C3, and further, the carrier CR1 is fixed by ~~retaining~~ engagement of the brake B3, and therefore the reduced speed rotation is output to the ring gear R3 ~~by~~ through the fixed carrier CR1, and from the ~~reduced rotation is input~~ ring gear R3 to the sun gear S3 via the transmitting member 30. ~~In this case,~~ Because the ring gear R1 and the sun gear S3 are rotating at a reduced speed, ~~therefore the above-mentioned~~ the transmitting member 30 ~~performs~~ transmits a relatively large torque ~~transmission~~. ~~On the other hand, at~~ In first speed forward, second speed forward, fourth speed forward, and sixth speed forward, the rotation of the sun gear S3 is input to the ring gear R1 via the transmitting member 30, but because the clutch C3 and the brake B3 are released, the carrier CR1 and the sun gear S1 ~~are~~ freely rotat~~ing~~e.

~~Now, the actions~~ Operations of the sixth embodiment other than those of the ~~above-mentioned~~ second planetary gear unit PR, are similar to those of the ~~above-described~~ first embodiment (see Fig. 2 and Fig. 3), and accordingly description thereof will not be ~~omitted.~~ repeated here.

As described above, ~~according to~~ in the automatic transmission ~~device~~ 1_5 of the ~~relating to the present invention~~, due to location of the second planetary gear unit PR and the clutch C1 ~~being configured~~ on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 being ~~configured~~ located on the other side ~~in the axial direction~~ of the first planetary

gear unit PU, the second planetary gear unit PR and the first planetary gear unit PU can be ~~configured~~ located more closely together, as compared to ~~the~~ a transmission ~~case~~ wherein, for example, two clutches C1 and C2 are ~~configured in~~ located between the second planetary gear unit PR and first planetary gear unit PU, and the transmitting member 30 ~~for transmitting reduced rotation~~ can be made relatively shorte~~ned~~n. ~~By doing so~~ Thus, the automatic transmission can be made more compact and ~~more~~ lightweight. Further, because the inertia (force ~~of~~ inertia) ~~can be~~ is reduced, the controllability of the automatic transmission ~~can be~~ is increased, and the occurrence of speed change shock ~~can be~~ is reduced. Further, compared to ~~the case~~ a transmission wherein three clutches C1, C2, C3 are ~~configured~~ located on one side of the first planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 92, 93) that supply the ~~oil pressure~~ hydraulic servos 11, 12, and 13 of these clutches C1, C2, C3 can be more constructed easily, ~~and~~ the manufacturing process can be simplified and the costs ~~brought down~~ can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11, 12, and 13 are ~~provided~~ mounted on the input shaft 2, the seal rings 81 and 82 serve to connect ~~seal~~ oil supply from the case 3 ~~and supply oil~~ to the oil lines 2a and 2b, 2c provided within input shaft 2, and therefore oil can be supplied to the oil chambers of ~~oil pressure~~ hydraulic servos 11, 12, and 13 without providing the seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11, 12, and 13. Therefore, ~~oil can be supplied simply by providing the seal~~

~~rings 81 and 82 each for the oil pressure servos 11, 12, and 13, and~~ sliding resistance from the seal rings can be minimized, and ~~therefore~~ the efficiency of the automatic transmission can be improved.

Further, due to the counter gear 5 being located ~~configured in the axial direction~~ between the first planetary gear unit PU and the second planetary gear unit PR, the counter gear 5 can be located ~~configured~~ in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, when the automatic transmission is mounted on a ~~the~~ vehicle, enlarg~~ing~~ement towards ~~one direction of the axis (particularly in~~ the rear ~~direction~~ ("when the input side facing ~~from~~ the drive source is the front" ~~direction~~) is not necessary ~~can be prevented~~ because the counter gear 5 is mounted to mate with ~~match~~ the drive wheel transmission device. Because of this, particularly in the case of a~~n~~ FF vehicle, ~~the~~ interference with ~~toward~~ the front wheels is reduced, ~~and the~~ mountability on a vehicle is ~~can be~~ improved, and ~~such as~~ the steering angle is ~~being~~ greatly increased, ~~for example.~~

Again ~~Further~~, where ~~in the event that~~ the clutch C3 is placed between the ring gear R1 and the sun gear S3 ~~for example~~, it must be sufficiently large to transmit the high torque, ~~the~~ reduced speed rotation ~~must be engaged and disengaged, and becomes relatively large~~, but by placing the clutch C3 between the input shaft 2 and the sun gear S1, it can indirectly control ~~the engaging and disengaging of the rotation of the input shaft 2 from this clutch C3 causes the~~ reduced speed rotation output of from the ring gear R1 of the second

planetary gear unit PR ~~to be engaged and disengaged~~, and therefore ~~clutch C3~~ can be made more compact, and likewise ~~therefore~~ the automatic transmission can be made more compact.

Further, the automatic transmission ~~device~~ 1_5 according to the Sixth ~~present~~ embodiment is ~~a transmission device that is~~ directly coupled in ~~at~~ fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine speed ~~revolutions~~ can be lowered, thereby allowing the To run more quietly ~~and this contributes to the quietness of the vehicle while running~~ at a high speed.

~~[~~Sixth Embodiment~~]~~

~~Below, the~~ A sixth embodiment, which is a partial modification of the first embodiment, will now be described ~~below~~ with reference to Fig. 12. ~~Fig. 12 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the sixth embodiment. Now,~~ Components of the sixth embodiment which are the same as those of the first embodiment ~~will be~~ are denoted by ~~with~~ the same reference numerals, and description thereof omitted, except for those components partially modified ~~partial modifications~~.

No ¶

As Fig. 12 illustrates, the automatic transmission ~~device~~ 1_6 of the ~~automatic transmission relating to the~~ sixth embodiment has ~~configures~~ the clutch C2 located on ~~one side in the~~

~~axial direction wherein the~~ planetary gear unit PR side of the planetary gear unit PU ~~is configured~~, and the clutch C1 ~~C2~~ is located ~~configured~~ on its ~~the~~ other side. ~~in the axial direction,~~ or in other words, the sixth embodiment has ~~configuration is such that~~ the positions of ~~where~~ the clutch C1 and the clutch C2 ~~are disposed are~~ switched as compared to that of the automatic transmission ~~device~~ 1_1 of the ~~automatic transmission of the~~ first embodiment (see Fig. 1).

This automatic transmission ~~device~~ 1_6 includes ~~comprises~~ a multi-disc clutch C2 comprising a hydraulic ~~an oil pressure~~ servo 12, ~~a~~ friction plates 72, ~~a drum-shaped member 23 that forms a~~ a clutch drum 23, a hub unit 24 linked to a sun gear S2 ~~on the~~ radially inward ~~inner circumference side~~ of the ~~above-mentioned~~ input shaft 2, and a multi-disc clutch C3 comprising a hydraulic ~~an oil pressure~~ servo 13, ~~a~~ friction plates 73, ~~a drum-shaped member 25 that forms~~ a clutch drum 25, and a hub unit 24 linked to a sun gear S2 at ~~on~~ the outer circumference. ~~side. Further,~~ The automatic transmission further includes a multi-disc brake B1 comprising a hydraulic ~~an oil pressure~~ servo 14 and ~~a~~ friction plates 74.

The ~~above~~ drum-~~shaped member~~ 23 is connected to the ~~above~~ input shaft 2, and ~~on~~ the inner circumferential surface ~~circumference side~~ of a ~~the~~ front portion is ~~edge of this drum-shaped member 23 is configured~~ ~~by~~ splined ~~spling~~ to the friction plates 72 of the clutch C2 which can be engaged by the hydraulic ~~oil pressure~~ servo 12 ~~of the clutch C2~~, and the edges ~~inner circumference side of the~~ friction plates 72 are intermeshed ~~of~~

with friction plates splined ~~this clutch C2 is connected~~ to the hub unit 24 ~~by splining~~. Further, this hub unit 24 is connected to the above-mentioned carrier CR2.

~~On the other hand, on~~ At the other ~~edge~~ end of the input shaft 2 (left side of the diagram) is ~~configured~~ a multi-disc clutch C1 comprising ~~an oil pressure~~ a hydraulic servo 11, friction plates 71, a ~~drum-shaped member 21 that forms a~~ clutch drum 21 and a hub unit 22 linked to a sun gear S2.

~~Further, on the above-mentioned input shaft 2, as in the left side of the diagram, the drum-shaped member 21 is connected, on~~ The inner circumferential surface ~~side~~ of the front ~~edge~~ portion of this drum~~-shaped member~~ 21 is ~~configured by means of~~ splined to the friction plates 71 of the clutch C1 that can be engaged by operation of the ~~oil pressure~~ hydraulic servo 11~~, for the clutch C1~~. ~~On~~ The ~~inner circumference side of the~~ friction plates 71 ~~of this clutch C1~~ are intermeshed with friction plates splined to the hub unit 22 ~~is splined, and this hub unit~~ which ~~22~~ is connected to the ~~above-mentioned~~ sun gear S2.

The operations of the automatic transmission ~~device~~ 1_6 of the sixth embodiment ~~based on the above construction,~~ are similar to those of the ~~above-mentioned~~ first embodiment (see Fig. 2 and Fig. 3), and accordingly description thereof will be omitted here.

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_6 ~~relating to the present invention,~~ of this sixth embodiment, due to the second planetary gear unit PR and the clutch C2 being ~~configured~~ located on one side ~~in the axial direction~~ of the

first planetary gear unit PU, and the clutch C1 being ~~configured~~ located on the other side ~~in the axial direction~~ of the first planetary gear unit PU, the second planetary gear unit PR and the first planetary gear unit PU can be ~~configured~~ located more closely together, as compared to ~~the~~ a transmission ~~case~~ wherein, for example, two clutches C1 and C2 are ~~configured in~~ located between the second planetary gear unit PR and the first planetary gear unit PU, and the transmitting member 30 ~~for transmitting reduced rotation~~ can be made relatively shorte~~ned~~r. ~~By doing so~~ In this manner, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to ~~the case~~ a transmission wherein three clutches C1, C2, C3 are ~~configured~~ located on one side of the first planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 92, 93) that supply the ~~oil pressure~~ hydraulic servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed more easily, ~~and~~ the manufacturing process can be simplified, and the costs ~~brought down~~ can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ mounted on the input shaft 2, one set of seal rings (81 ~~and~~ or 82) ~~seal the case 3 and~~ serve to form a supply oil ~~to~~ connection between the oil lines 2a and 2b ~~provided~~ within input shaft 2, and the case 3, and therefore oil can be supplied to the oil chambers of ~~oil pressure~~ hydraulic servos 11 and 12 without providing ~~the~~ seal rings between, for example, the

input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Further, the ~~oil pressure~~ hydraulic servo 13 can receive supply of oil directly from the boss ~~unit~~ 3a extended from the case 3, i.e. without passing through other parts ~~for example~~, and therefore the oil ~~can~~ supply oil can be connected by providing one set of seal rings 80. Therefore, ~~oil can be supplied simply by providing one set of seal rings 81 and 82 each for the oil pressure servos 11 and 12, and~~ sliding resistance from the seal rings can be minimized, and ~~therefore~~ the efficiency of the automatic transmission can be improved.

~~Further,~~ Since the clutch C2 is ~~configured on the inner circumference side~~ located radially inward of the clutch C3, the clutch C3, which must transmit ~~a~~ a relatively large torque, ~~in order to transmit the reduced~~ low speed rotation, can be ~~configured on~~ located near the outer circumference ~~side~~, and this clutch C3 and ~~the oil pressure~~ its hydraulic servo 13 ~~thereof~~ can have an increased diameter, a larger ~~Particularly the~~ pressure receiving area ~~of the oil chamber of the oil pressure servo 13 can be enlarged~~, and ~~the capacity capable of~~ a larger torque transmission ~~of this clutch C3 can be increased.~~ capacity. Further, by giving ~~By configuring~~ the clutch C2 ~~which can have~~ a smaller ~~capacity for~~ torque transmission capacity compared to the clutch C3, the automatic transmission can be made more compact.

As with the previously described embodiments ~~Further~~, because the counter gear 5 is ~~configured in the~~ located axially ~~direction~~ between the first planetary gear unit PU and the second planetary gear unit PR, the counter gear 5 can be located ~~configured~~

in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, when the automatic transmission is mounted on the vehicle, enlarg~~ing~~ement toward~~s~~ ~~one direction of the axis (particularly in~~ the rear ~~direction~~ (when the input side facing ~~from~~ the drive source is the " front " ~~direction~~) is unnecessary ~~can be prevented~~ because the counter gear 5 is mounted to mate with ~~match~~ the drive wheel transmission device. Because of this, particularly in the case of a~~n~~ FF vehicle, ~~the~~ interference with ~~toward~~ the front wheels is reduced, ~~and~~ the mountability on a vehicle is ~~can be~~ improved, and ~~such as~~ the steering angle is ~~being~~ greatly increased. ~~for example.~~

Further, the clutch C1 ~~is a clutch which~~ engages at the relatively slow to medium speeds ~~levels~~ of first speed forward, second speed forward, third speed forward, and fourth speed forward, and therefore when ~~this~~ clutch C1 is released at the relatively high speeds ~~levels~~ of fifth speed forward, sixth speed forward, or first speed reverse, ~~particularly~~ the hub unit 22 that connects this clutch C1 and the sun gear S2, in particular, rotates at a relatively high speed ~~revolution~~ or ~~revolves~~ in reverse (see Fig. 7). On the other hand, in ~~at the~~ fifth speed forward and ~~or~~ first speed reverse the transmitting member 30 rotates at a reduced ~~reduces rotation~~ speed, and in ~~at the~~ sixth speed forward the transmitting member 30 may be fixed ~~in some cases~~, and the difference in rotational speed ~~revolutions~~ between the hub unit 22 and the transmitting member 30 can be great ~~occur~~. However,

because this clutch C1 is located on the ~~opposite~~ side of the first planetary gear unit PU opposite ~~PR via~~ the second planetary gear unit PR ~~PU~~, the hub unit 22 and the transmitting member 30 can be spaced ~~configured~~ apart from one another. Compared with a transmission ~~case~~ wherein these units are in contact due to a multi-axial configuration ~~for example~~, decreased efficiency of the automatic transmission resulting from friction and so forth from the relative rotation of those units can be prevented.

Further, the automatic transmission ~~device~~ 1_6 according to the sixth ~~present~~ embodiment is ~~a transmission device that is~~ directly coupled in ~~at~~ fourth speed forward. Therefore, in ~~at~~ fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine speed ~~revolutions~~ can be lowered, allowing the ~~and this contributes to the quietness of the~~ vehicle to ~~while~~ run~~ning~~ more quietly at a high speed.

~~Now, the linking member (in particular~~ The transmitting member which is ~~for~~ link~~ing~~ the second planetary gear unit PR and the first planetary gear unit PU must be sufficiently ~~requires~~ rigid~~ity~~ to withstand the reduced, high speed torque that it transmits ~~is input~~. For example, ~~in the case of configuring~~ a clutch that engages at a slow to medium speed or a clutch that engages and disengages for transmission of reduced speed rotation ~~on the inner circumference side of the linking member, the clutches~~ must have a large capacity, therefore a

appropriate diameter ~~to correspond with~~ for this capacity transmitting becomes necessary. Therefore, in the event that the transmitting (linking) member ~~is the type that~~ passes on the radially outer ~~circumference~~ side of this type of clutch, in even ~~a~~ larger diameter for ~~than the necessary diameter measurement of~~ those clutches becomes necessary, ~~and~~ the diameter ~~measurement~~ of the transmitting ~~linking~~ member is enlarged more than necessary, and the radial dimension of the automatic transmission as a whole becomes greater. ~~in the radial direction.~~ Accordingly, it is an object of this embodiment to reduce ~~the enlargement of~~ the diameter ~~measurement~~, and thereby provide a more compact automatic transmission.

~~According to the present~~ In this sixth embodiment, all clutches can be ~~configured without~~ arranged so as to avoid need for enlarging the diameter ~~measurement~~ of the linking member, ~~by configuring~~ specifically by arranging a clutch C2 with a small capacity ~~on the linking member, particularly~~ on the radially inward ~~inner circumference~~ side of the transmitting member 30.

Seventh Embodiment

The seventh embodiment is partial~~ly modified from~~ modification of the sixth embodiment and will be described ~~now~~ with reference to Fig. 13. ~~Fig. 13 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the seventh embodiment.~~

~~Now,~~ Components of the seventh embodiment which are the same as those of the sixth embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted here,

except for these components which are partially modifi~~cations~~ed.

As Fig. 13 illustrates, the automatic transmission ~~device~~ 1_7 of the ~~automatic transmission relating to the~~ seventh embodiment has ~~is~~ a modifi~~cation of the~~ed configuration of the planetary gear PR ~~and~~, the clutch C2 and the clutch C3, as compared to ~~that of~~ the automatic transmission ~~device~~ 1_6 of ~~the automatic transmission of~~ the sixth embodiment (see Fig. 12).

The clutch C2 and the clutch C3 are located ~~is configured~~ on the ~~opposite~~ side of the second planetary gear unit PR ~~PU~~ (right side of diagram) opposite ~~of~~ the first planetary gear unit PU ~~PR~~ within the ~~this~~ automatic transmission ~~device~~ 1_7. The inner circumferential surface ~~ence side~~ of ~~the~~ a front portion ~~edge~~ of the drum ~~shaped member~~ 25 of this clutch C3 is splined to the friction plates 73, which are intermeshed with ~~and the inner circumference side of this~~ friction plates [illegible] are splined to the hub unit 26. The drum ~~shaped member~~ 25 is connected to the input shaft 2, and the hub unit 26 is connected to the sun gear S1 of the second planetary gear unit PR. ~~Further,~~ The clutch C2 comprises ~~ing~~ a hydraulic ~~oil pressure~~ servo 12, ~~a~~ friction plates 72, a drum ~~shaped member~~ 23, and a hub unit 24 and is located ~~configured on the inner circumference side~~ radially inward of the ~~above-mentioned~~ clutch C3, that is to say, clutch C2 is enclosed within the hub unit 26.

On the other hand, ~~on the outer circumference side~~ radially outward of the second planetary gear unit PR is ~~configured~~ a multi-disc brake B1 that comprises a hydraulic ~~an oil pressure~~ servo 14 and ~~a~~ friction plates

74. The side plate of the carrier CR1 of this second planetary gear unit PR is fixed to and supported by the case 3. Further, the ring gear R1 is connected to the sun gear S3 by the transmitting member 30, and the friction plates 74 of the brake B1 ~~is~~ are splined to the outer circumferen~~ce side~~tial surface of this transmitting member 30~~, and this transmitting member 30 is connected to the sun gear S3~~.

The operations of the automatic transmission ~~device~~ 1_7, of this seventh embodiment ~~based on the above construction,~~ are similar to those of the third embodiment (see Fig. 6 and Fig. 7), and accordingly description thereof will be omitted here.

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_7 ~~relating to the present invention~~ of the seventh embodiment, due to the second planetary gear unit PR and the clutch C2 being ~~configured~~ located on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C1 being ~~configured~~ located on the other side ~~in the axial direction~~ of the first planetary gear unit PU, the second planetary gear unit PR and the first planetary gear unit PU can be ~~configured~~ located more closely together, as compared to ~~the case~~ in embodiment wherein, for example, two clutches C1 and C2 are ~~configured in~~ located between the second planetary gear unit PR and the first planetary gear unit PU, and the transmitting member 30 ~~for~~ which transmit~~ting~~s the reduced speed rotation can be made relatively shorte~~ned~~r. ~~By doing so~~ In this manner, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, ~~the~~ controllability of

the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are located ~~configured~~ on one side of the first planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 92, 93) that supply the hydraulic ~~oil pressure~~ servos 11, 12, and 13 of these clutches C1, C2, C3 can be more constructed easily, ~~and~~ the manufacturing process can be simplified, and the costs can be reduced ~~brought down~~.

Further, since the hydraulic ~~oil pressure~~ servos 11 and 12 are mounted ~~provided~~ on the input shaft ~~2, one set~~ of seal rings 81 and 82 serve to connect ~~seal~~ the case 3 and the supply of oil from to the oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chambers of hydraulic ~~oil pressure~~ servos 11 and 12 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the hydraulic ~~oil pressure~~ servos 11 and 12. Further, the hydraulic ~~oil pressure~~ servo 13 can be supplied with oil directly from the boss ~~unit~~ 3a extended from the case 3, i.e. without passing through other components ~~parts for example~~, and therefore oil ~~can~~ supply can be connected ~~oil~~ by providing one set of seal rings 80. Therefore, ~~oil can be supplied simply by providing one set of seal rings 81, 82, and 80 each for the oil pressure servos 11, 12, and 13,~~ ~~and~~ sliding resistance from the seal rings can be minimized, and ~~therefore the~~ efficiency of the automatic transmission can be improved.

Further, since the counter gear 5 is located ~~configured in the~~

axial ly ~~direction~~ between the first planetary gear unit PU and the second planetary gear unit PR, the counter gear 5 can be ~~configured~~ located in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. In this embodiment also, ~~For example, when the automatic transmission is mounted on the vehicle~~, enlarg~~ing~~ ement toward~~s~~ ~~one direction of the axis (particularly in~~ the rear ~~direction~~ (when the input side ~~from~~ facing the drive source is the front ~~direction~~) ~~can be prevented~~ is not necessary because the counter gear 5 is mounted to ~~match~~ mate with the drive wheel transmission device. Because of this, particularly in the case of a~~n~~ FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, ~~and the~~ mountability on a vehicle ~~can be~~ is improved, ~~such as the~~ and the steering angle ~~being~~ is greatly increased. ~~for example.~~

~~Further,~~ The clutch C1 ~~is a clutch which~~ engages at the relatively slow to medium speeds ~~levels~~ of first speed forward, second speed forward, third speed forward, and fourth speed forward, and therefore when ~~this~~ clutch C1 is released at the relatively high speeds ~~levels~~ of fifth speed forward, sixth speed forward, or first speed reverse, in particular~~ly~~ the hub unit 22 that connects ~~this~~ clutch C1 and the sun gear S2 rotates at a relatively high speed ~~revolution~~ or ~~revolves~~ in reverse (see Fig. 7). On the other hand, in ~~at~~ ~~a~~ fifth speed forward and ~~or~~ first speed reverse the transmitting member 30 ~~reduces~~ rotates ~~rotation~~ at a reduced speed, and ~~at a~~ in sixth speed forward the transmitting member 30 can be engaged,

7th Embod
Fig. 13

whereby there can be a large ~~and~~ difference in ~~revolutions~~ speed as between the hub unit 22 and the transmitting member 30, ~~can occur~~. However, because ~~this~~ clutch C1 is located on the ~~opposite~~ side of the first planetary gear unit PU ~~PR~~ ~~via~~ opposite the second planetary gear unit PR ~~PU~~, the hub unit 22 and the transmitting member 30 can be ~~configured~~ spaced apart from one another. In comparison with a transmission ~~the case~~ wherein, for example, these members are in contact due to a multi-axial configuration, decreased efficiency of the automatic transmission resulting from friction and so forth from the relative rotation ~~of those units~~ can be prevented.

~~Further, in the event that~~ If the clutch C3 were to be ~~is~~ placed between the ~~ring~~ gear ~~R1 and the sun gear S3, for example~~, the reduced speed rotation must it ~~be~~ engaged and disengaged, and therefore must be ~~becomes~~ relatively large. However, ~~but~~ by placing the clutch C3 between the input shaft 2 and the sun gear S1, the engaging and disengaging of the rotation of the input shaft 2 by ~~from this~~ clutch C3 indirectly ~~causes~~ controls output of the reduced rotation ~~output~~ from the ring gear R1 of the second planetary gear unit PR ~~to be engaged and disengaged~~, and therefore the clutch C3 ~~can be made more compact,~~ and ~~therefore~~ the automatic transmission as a whole can be made more compact.

Further, the automatic transmission ~~device~~ 1_7 according to the seventh ~~present~~ embodiment is ~~a transmission device that is~~ directly coupled in ~~at~~ fourth speed forward. Therefore, in ~~at~~ fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when

~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be lowered, ~~and this contributes to the quietness of~~ thereby allowing the vehicle ~~while running~~ to run more quietly at a high speed.

~~Now, when~~ If a clutch ~~is configured in~~ were to be located between the second planetary gear unit PR and the first planetary gear unit PU, for example, the length of the linking member (~~particularly the~~ unit second transmitting member) that links the second planetary gear unit PR and the first planetary gear unit PU ~~becomes longer in the~~ must be axially elongated ~~direction,~~ and because this ~~linking~~ transmitting member ~~is for~~ transmits the reduced speed rotation, the thickness of the unit must be increased so as to withstand ~~this~~ the high torque, and therefore the weight ~~also~~ is increased. Therefore an object of the present invention is to provide an automatic transmission ~~that can~~ wherein ~~shorten~~ the distance between the speed reducing second planetary gear unit and the first planetary gear unit is reduced, and ~~reduce the increase in~~ the weight is thereby reduced.

~~With the present~~ In this seventh embodiment, in particular, the clutch C2 is ~~disposed~~ located on the ~~opposite~~ side ~~in the axial direction~~ of the second planetary gear unit PR axially opposite ~~PU from~~ the first planetary gear unit PU ~~PR~~, and therefore, ~~providing~~ locating a clutch between the first and second planetary gear units ~~PR and the planetary gear unit PU~~ is not necessary, and the length of the ~~linking~~ transmitting member~~, particularly the transmitting member~~ 30 can be made that much shorter. Therefore, ~~increase in~~ the weight of the automatic transmission as a whole

can be ~~prevented~~ reduced.

Eighth Embodiment

~~Now,~~ The eighth embodiment, which is a partial modification of the sixth embodiment, will be described with reference to Fig. 14. ~~Fig. 14 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the eighth embodiment. Now,~~ Components of the eighth embodiment which are the same as those of the sixth embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof is omitted here, except for ~~partial~~ those components, which are modified.

As Fig. 14 illustrates, the automatic transmission ~~device~~ 1_8 of the ~~automatic transmission relating to the~~ eighth embodiment ~~is a modification of~~ has the configuration of the clutch C2 modified, ~~and further, configures~~ has a brake B3 instead of a clutch C3, and enables the carrier CR1 of planetary gear PR to be fixed by the brake B3, ~~as compared with that~~ which features differ from those of the automatic transmission ~~device~~ 1_6 ~~of the automatic transmission~~ of the first embodiment (see Fig. 12).

Within the automatic transmission ~~device~~ 1_8 of the eighth embodiment, the brake B3 is ~~configured~~ located on the side of the second planetary gear unit PR ~~on the~~ axially opposite (right side on the diagram) ~~from~~ the planetary gear unit PU. ~~This~~ Brake B3 comprises ~~an oil pressure~~ a hydraulic servo 16, ~~a~~ friction plates 76, and a hub unit 33. ~~Further,~~ The clutch C2, compris~~ing an oil pressure~~es a hydraulic servo 12, ~~a~~ friction plates 72, a

drum~~-shaped member~~ 23, and a hub unit 24, and located radially is ~~configured on~~ inward of the ~~the inner circumference side of above mentioned~~ brake B3, i.e. ~~that is to say, is enclosed~~ within the hub unit 33. The hub unit 33 of ~~this~~ brake B3 is connected to one ~~the~~ side plate of ~~one side of~~ the carrier CR1, and the other (opposite) side plate of the ~~other side of this~~ carrier CR1 is rotatably supported by the input shaft 2. ~~so as to be capable of rotating.~~ Further, the sun gear S1 is connected to the input shaft 2 via the drum~~-shaped member~~ 24 of the clutch C2. ~~Also,~~ The friction plates 74 of the brake B1 are ~~is~~ splined to ~~with~~ the outer circumferential surface ~~circumference side~~ of the ring gear R1, and this ring gear R1 is connected by ~~to~~ the transmitting member 30~~, and is connected~~ to the sun gear S3. ~~via this transmitting member 30.~~

The operations of the automatic transmission ~~device~~ 1_8 of ~~based on~~ the eighth embodiment ~~above construction,~~ are similar to those of the fourth embodiment (see Fig. 9 and Fig. 10), and accordingly description thereof will not be repeated here ~~omitted~~.

~~As described above, according to~~ In the automatic transmission device 1_8 of ~~relating to~~ the eighth embodiment ~~present invention,~~, due to the second planetary gear unit PR and the clutch C2 being located ~~configured~~ on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C1 being located ~~configured~~ on the axially opposite ~~other~~ side ~~in the axial direction~~ of the first planetary gear unit PU, the second planetary gear unit PR and the first planetary gear unit PU can be located more ~~configured~~ closely together, as compared to the

~~case~~ a transmission wherein, for example, two clutches C1 and C2 are ~~configured in~~ located between ~~the~~ first and second planetary gear ~~PR and planetary gear unit PU~~ units, and the transmitting member 30 ~~for transmitting reduced rotation~~ can be relatively shortened. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) ~~can be~~ is reduced, the controllability of the automatic transmission ~~can be~~ is increased, and the occurrence of speed change shock ~~can be~~ is reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ mounted on the input shaft 2, the seal rings 81 and 82 ~~seal~~ serve ~~the case 3 and~~ to connect supply of oil ~~to~~ between the oil lines 2a and 2b provided within input shaft 2 and the case 3, and therefore oil can be supplied to the oil chambers of ~~oil pressure~~ hydraulic servos 11 and 12 without providing the seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Therefore, ~~oil can be supplied simply by providing the seal rings 81 and 82 each for the oil pressure servos 11 and 12,~~ ~~and~~ sliding resistance from ~~the~~ seal rings can be minimized, and ~~therefore~~ the efficiency of the automatic transmission can be improved.

Further, since the counter gear 5 is ~~configured in the~~ located axially ~~direction~~ between the two planetary gear units ~~PU and the planetary gear PR~~, the counter gear 5 ~~can be configured~~ is in approximately the center ~~in the~~ axial ~~direction~~ of the

automatic transmission. As in the previously described embodiments ~~For example~~, ~~when the automatic transmission is mounted on the vehicle,~~ enlarging toward~~s~~ ~~one direction of the axis (particularly in~~ the rear ~~direction~~ "(when the input side ~~from~~ facing the drive source is the front ~~direction~~)" ~~can be prevented~~ is not necessary because the counter gear 5 is mounted to ~~match~~ mate with the drive wheel transmission device. Because of this, particularly in the case of a~~n~~ FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, ~~and the~~ mountability on ~~a~~ the vehicle ~~can be~~ is improved, ~~such as~~ and the steering angle ~~being~~ is greatly increased~~, for example~~.

Further, the clutch C1 ~~is a clutch which~~ engages at the relatively slow to medium speeds ~~levels~~ of first speed forward, second speed forward, third speed forward, and fourth speed forward, and therefore when this clutch C1 is released at the relatively high speed levels of fifth speed forward, sixth speed forward, or first speed reverse, ~~particularly~~ the hub unit 22 that connects this clutch C1 and the sun gear S2 rotates at a relatively high ~~revolution~~ speed or ~~revolves~~ in reverse (see Fig. 10). On the other hand, ~~at~~ in ~~the~~ fifth speed forward or first speed reverse the transmitting member 30 rotates at reduced ~~rotation~~ speed, and ~~at a~~ in sixth speed forward the transmitting member 30 may be fixed in some cases, and a difference in ~~revolutions~~ speed between the hub unit 22 and the transmitting member 30 can ~~occur~~ result. However, because ~~this~~ clutch C1 is located on the ~~opposite~~ side of

the first planetary gear unit PU axially opposite ~~PR via~~ the second planetary gear unit ~~PU~~ PR, the hub unit 22 and the transmitting member 30 can be ~~configured~~ spaced apart from one another. In comparison with ~~the case~~ a transmission wherein, for example, these members are in contact due to a multi-axial configuration, ~~decreased~~ loss in efficiency of the automatic transmission resulting from friction and so forth from the relative rotation of those units can be prevented.

Further, because the reduced speed rotation output to the first planetary gear unit PU from the second planetary gear unit PR is ~~made to be~~ engaged and disengaged by the brake B3, the number of parts (for example drum-shaped members and so forth) can be reduced as compared to ~~the case wherein, for example, a~~ an embodiment employing a clutch C3 ~~is provided~~. Further, the brake B3 can ~~configure an oil line~~ receive oil supply directly from the case 3, and therefore the configuration of the oil line can be simplified as compared ~~to the case wherein, for example,~~ an embodiment employing a clutch C3. ~~is provided.~~

Further, the automatic transmission ~~device~~ 1_8 according to the ~~present~~ eighth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be lowered, ~~and this contributes to the quietness of the~~ allowing the vehicle ~~while~~ to run~~ning~~ more quietly at a high speed.

~~Now, when~~ Is a clutch is ~~configured in~~ located between the first and second ~~planetary gear PR and the~~ planetary gear units ~~PU for example~~, the length of the ~~linking member (particularly the~~ transmitting member ~~)~~ that links the first ~~planetary gear PR~~ and second ~~the~~ planetary gear units PU ~~becomes longer in the~~ must be axially elongated ~~direction~~, and since this transmitting ~~linking~~ member ~~is for~~ transmits ~~ting~~ the reduced speed rotation, its ~~the~~ thickness ~~of the member~~ must be increased so as to withstand a high torque ~~this~~, and therefore the weight is also increased. Therefore, an object of the present invention is to provide an automatic transmission in which ~~that can shorten~~ the distance between the speed reducing ~~tion~~ second planetary gear unit and the first planetary gear unit is shortened and the ~~and reduce the increase in~~ weight is Thereby reduced.

~~With the present~~ In this eighth embodiment, in particular, the clutch C2 is disposed on ~~the opposite~~ side ~~in the axial direction~~ of the second planetary gear unit ~~PU~~ PR ~~from~~ axially opposite the first planetary gear unit PU ~~PR~~, and therefore, provision of ~~ding~~ a clutch between the planetary gear units ~~PR and the planetary gear unit PU~~ is not necessary, and the length of the ~~linking member, particularly~~ the transmitting member 30 can be made that much shorter. Therefore, ~~an increase in~~ weight of the automatic transmission as a whole can be reduced ~~prevented~~.

Ninth Embodiment

~~Below,~~ The ninth embodiment, which is a partial modification of the first embodiment, will now be described.

with reference to Fig. 15. Fig. 15 is a schematic cross-~~sectional diagram illustrat~~ing the automatic transmission device of an autom~~atic transmission relating to the ninth embodiment. Now,~~ Components of the ninth embodiment which are the same as those of the first embodiment are ~~will be~~ denoted by ~~with~~ the same reference numerals, and description thereof omitted, except for partial modifications.

As Fig. 15 illustrates, the automatic transmission ~~device~~ 1_9 of the automatic transmission of ~~relating to~~ the ninth embodiment has ~~configures a~~ clutch C2 located ~~on one side in the~~ axially between ~~direction wherein~~ the planetary gear units ~~PR of the planetary gear unit PU is configured~~, and has ~~configures~~ the clutch C1 and the counter gear 5 on the ~~other~~ side of ~~in~~ the first planetary gear unit PU opposite the second planetary gear unit PR. Thus, axially ~~direction, that is to say, interchanges~~ the locations of the clutch C1 and the clutch C2 are reversed, and further, the positions of the second planetary gear unit PR, the clutch C3, and the brake B1 ~~are~~ and the position ~~configured on the opposite side~~ of the counter gear 5 are reversed ~~of the planetary gear unit PU,~~ as compared to ~~that of~~ the automatic transmission ~~device~~ 1_1 ~~of the automatic transmission~~ of the first embodiment (see Fig. 1).

Within the automatic transmission ~~device~~ 1_9, mounted on the ~~above-mentioned~~ input shaft 2 is ~~configured~~ a multi-disc clutch C1, which comprises a hydraulic ~~an oil pressure~~ servo 11, ~~a~~ friction plates 71, a ~~drum-shaped member 21 that forms a~~ clutch drum 21, and a hub unit 22 linked ~~liked~~ to a sun gear S2 on the

radially inner ~~circumference~~ side.

The oil chamber of this hydraulic ~~oil pressure~~ servo 11 is connected to ~~an~~ oil line 2a which, in turn, ~~is formed on the above-mentioned input shaft 2, and this oil line 2a is provided along one edge of the case 3, and~~ is connected to the oil line 91 of the boss ~~unit~~ 3a in the form of a sleeve surrounding one end of ~~which is provided on~~ the input shaft 2 ~~in a sleeve form~~. ~~Further, this~~ Oil line 91 ~~is~~ connects ~~connected~~ to the ~~an~~ oil pressure control unit, not illustrated. In other words, since the above-mentioned hydraulic ~~oil pressure~~ servo 11 is mounted ~~configured~~ on input shaft 2, ~~an~~ oil supply ~~line~~ from the oil pressure control unit~~, not illustrated,~~ to the oil chamber of the oil pressure servo 11 is connected ~~configured,~~ simply by providing one set of seal rings 81 ~~to seal~~ between the boss ~~unit~~ 3a ~~of the case 3~~ and the input shaft 2.

The ~~above-mentioned~~ input shaft 2 is connected to the ~~above-mentioned~~ drum~~-shaped member~~ 21, having an ~~and on the~~ inner ~~circumference side of this drum shaped member 21 is configured~~ surface to which the friction plates 71 of the clutch C1 ~~which is capable of engaging by the oil pressure servo 11 for the clutch C1,~~ are splined~~, and is connected wherein the inner circumference side of~~. The friction plates 71 of this clutch C1 are intermeshed with friction plates ~~is~~ splined to the hub unit 22, which, in turn, ~~Further, this hub unit 22~~ is connected to the ~~above mentioned~~ sun gear S2.

~~On the other hand,~~ On the other side of the input shaft 2 (left side in diagram) is ~~configured~~ a multi-disc clutch C2

that has ~~an oil pressure~~ a hydraulic servo 12, ~~a~~ friction plates 72, a ~~drum-shaped member 23 that forms~~ a clutch drum 23 and a hub unit 24 linked to a carrier CR2. On the outer circumference side is ~~configured~~ a multi-disc clutch C3 that comprises an oil pressure servo 13, a friction plate 73, and a clutch drum ~~unit~~ 25. ~~that forms a clutch drum.~~ Further, located on the outer circumferential side of the clutch drum ~~-shaped member~~ 25 is ~~configured~~ a multi-disc brake B1 that comprises ~~an oil pressure~~ a hydraulic servo 14 and ~~a~~ friction plates 74.

The oil chamber of ~~this oil pressure~~ hydraulic servo 12 is connected to an oil line 2b which is formed on the ~~above-mentioned~~ input shaft 2, and this oil line 2b ~~is provided along the edge of the case 3 that is the opposite side of that of the above-mentioned boss unit 3a, and~~ is connected to the oil line 93 of the boss ~~unit~~ 3b which is ~~provided on~~ formed as a sleeve around one end of the input shaft 2, ~~in a sleeve form~~. Therefore, ~~an~~ oil ~~line~~ communication from the oil pressure control unit ~~not illustrated~~ to the oil chamber of the ~~oil pressure~~ hydraulic servo 12 is ~~constructed on~~ connected the ~~above-mentioned oil pressure servo 12,~~ simply by providing one set of seal rings 82 ~~to seal~~ between the boss ~~unit~~ 3a ~~of the case 3~~ and the input shaft 2.

Further, the oil chamber of the ~~above-mentioned oil pressure~~ hydraulic servo 13 is connected to an oil line 94 ~~of~~ in the ~~above-mentioned~~ boss ~~unit~~ 3b, ~~and this~~ which oil line 94 is connected to ~~an~~ the oil pressure control unit, ~~not illustrated.~~

5th Embodiment

~~In other words, for the above-mentioned oil pressure servo 13, an oil line from the oil pressure control unit, not illustrated, to the oil chamber of the oil pressure servo 13 is constructed,~~ by providing one set of seal rings 84 to form a seal between the boss ~~unit~~ 3b ~~of the case 3~~ and the clutch drum ~~shaped member~~ 25.

~~Further, the above-mentioned~~ The input shaft 2 is connected to the ~~above-mentioned~~ clutch drum ~~shaped member~~ 23 ~~on~~ at the left side of the diagram, and ~~on~~ the inner circumferen~~ce side~~tial surface of this clutch drum ~~shaped member~~ 23 is ~~configured~~ splined to the friction plates 72 of the clutch C2, which are intermeshed with friction plates ~~is capable of engaging by the oil pressure servo 12 for the clutch C2, splined, and is connected wherein the inner circumference side of the friction plate 72 of this clutch C2 is~~ splined to the hub unit 24 which ~~. Further, this hub unit 24~~ is connected to the ~~above-mentioned~~ carrier CR2.

~~Further,~~ The above-mentioned clutch drum ~~shaped member~~ 25 is rotatably supported by the ~~above-mentioned~~ boss ~~unit~~ 3b ~~so as to rotate~~, and ~~on~~ the outer circumferen~~ce side of the front edge~~tial surface of a front portion of ~~this~~ clutch drum ~~shaped member~~ 25 is ~~configured the~~ splined to friction plates 74 of the brake B1 which is engaged/disengaged ~~capable of retaining~~ by operation of the ~~oil pressure~~ hydraulic servo 14. ~~for the above-mentioned brake B1, splined. On~~ The inner circumferen~~ce side~~tial surface of the front ~~edge~~ portion of ~~this~~ clutch drum ~~shaped member~~ 25 is ~~configured~~ splined to the friction plates 73 of the clutch C3 which is engaged/disengaged ~~capable of engaging~~ by operation of the ~~oil pressure~~ hydraulic servo 13 for the

friction plates

clutch C3. ~~splined, and on the inner circumference side of~~

are intermeshed with splined to

The friction plates 73 of this clutch C3 the ring gear R1. ~~is splined.~~

Further, carrier CR1 has a pinion Pa and a pinion Pb. ~~and this~~ Pinion Pb meshes with the ~~above-mentioned~~ ring gear R1, and ~~this~~ pinion Pa meshes with ~~to~~ the sun gear S1 which is ~~Is~~ connected to the input shaft 2. This carrier CR1 is secured to the boss ~~unit~~ 3b ~~of the case 3~~ via a side plate, and this ring gear R1 is rotatably supported by a support element ~~ing unit~~ 26 exending to ~~to~~ the boss ~~unit~~ 3b, ~~so as to rotate.~~

Further, ~~to~~ the ~~above-mentioned~~ clutch drum ~~shaped member~~ 25 is connected by a linking member 30 that transmits ~~the~~ rotation of the ring gear R1, when the clutch C3 is engaged, ~~and further, to the other side of this transmitting member 30 is connected~~ to the sun gear S3 of the above-mentioned first planetary gear unit PU.

The operations of the automatic transmission ~~device~~ 1_9 of this ninth embodiment ~~based on the above construction,~~ are similar to those of the first embodiment (see Fig. 2 and Fig. 3), and accordingly description thereof will not be ~~omitted.~~ repeated here.

As described above, ~~according to~~ in the automatic transmission ~~device~~ 1_9 of the ninth embodiment, because ~~relating to the present invention,~~ ~~due to~~ the second planetary gear unit PR and the clutch C2 are ~~being~~ located ~~configured~~ on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C1 is located ~~being configured~~

on the axially opposite ~~other~~ side ~~in the axial direction~~ of the first planetary gear unit PU, the second planetary gear unit PR and the first planetary gear unit PU can be located more ~~configured~~ closely together, as compared to an automatic transmission ~~the case~~ wherein, for example, two clutches C1 and C2 are located ~~configured in~~ between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 30 for transmitting the reduced speed rotation can be made relatively shorte~~ned~~r. In this manner ~~By doing so~~, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are located ~~configured~~ on one side of the planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 93, 94) that supply the hydraulic ~~oil pressure~~ servos 11, 12, and 13 of these clutches C1, C2, C3 can be more construct~~ed~~ easily, ~~and~~ the manufacturing process can be reduced can be simplified and the costs ~~brought down~~.

Further, since the hydraulic ~~oil pressure~~ servos 11 and 12 are located ~~provided~~ on the input shaft 2, one set of seal rings 81 and 82 form an oil supply connection by providing a seal between the case 3 and ~~supply oil to the~~ oil lines 2a and 2b provided within input shaft 2. ~~and~~ Therefore, oil can be supplied to the oil chambers of the hydraulic ~~oil pressure~~ servos 11 and 12 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the hydraulic ~~oil pressure~~ servos 11 and 12.

Further, the hydraulic ~~oil pressure~~ servo 13 can receive ~~supply~~ oil directly from the boss ~~unit~~ 3a which extends ~~extended~~ from the case 3, i.e. without passing through other components ~~parts for example~~, and therefore can be supplied ~~supply~~ oil by providing one set of seal rings 80. Therefore, the oil supply can be connected ~~supplied~~ simply by providing one set of seal rings 81 and 82, 84 each ~~for~~ of the oil pressure servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, because the clutch C2 is located radially inward ~~configured on the inner circumference side~~ of the clutch C3, the clutch C3, which must bear ~~transmit~~ a relatively large torque in ~~order to~~ transmitting the reduced speed rotation, can be located at ~~configured on~~ the outer circumference ~~side~~, and therefore this clutch C3 and the oil pressure servo 13 thereof can have an increased diameter. In particular, ~~ly~~ the pressure receiving area of the oil chamber of the oil pressure servo 13 can be enlarged, and the ~~capacity capable of~~ torque transmitting ~~transmission~~ capacity of this clutch C3 can be increased. By designing ~~configuring~~ the clutch C2 to ~~which can~~ have a smaller capacity ~~for~~ torque transmitting ~~transmission~~ than ~~compared to~~ the clutch C3, the automatic transmission can be made more compact.

Further, the clutch C1 ~~is a clutch which~~ engages at the relatively slow to medium speeds ~~levels~~ of first speed forward, second speed forward, third speed forward, and fourth speed forward, and therefore when this clutch C1 is

released at the relatively high speed levels of fifth speed forward, sixth speed forward, or first speed reverse, ~~particularly~~ the hub unit 22 that connects ~~this~~ clutch C1 ~~and~~ to the sun gear S2 rotates at a relatively high ~~revolution~~ speed or revolves in reverse (see Fig. 3). On the other hand, ~~at~~ in ~~the~~ fifth speed forward ~~or~~ and first speed reverse the transmitting member 30 rotates at reduce~~s~~d ~~rotation~~ speed, and ~~at a~~ in sixth speed forward the transmitting member 30 may be fixed in some cases, and therefore the speed of ~~difference in revolutions between~~ the hub unit 22 ~~and~~ may differ from that of the transmitting member 30~~, can occur.~~ However, because this clutch C1 is located on the ~~opposite~~ side of the first planetary gear unit PU ~~PR via~~ axially opposite the second planetary gear unit ~~PU~~ PR, the hub unit 22 and the transmitting member 30 can be ~~configured~~ spaced apart from one another. In comparison ~~with the case~~ to a transmission wherein, for example, these members are in contact due to a multi-axial configuration, a decrease~~d~~ in efficiency of the automatic transmission resulting from friction and so forth from the relative rotation of those units can be prevented.

Further, the automatic transmission ~~device~~ 1_9 ~~according to~~ of the ~~present~~ ninth embodiment ~~is a transmission device that~~ is directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be

lowered, thus allowing ~~and this contributes to the quietness of~~ the vehicle to ~~while~~ run~~ning~~ more quietly at a high speed.

~~Now, the linking member (in particular~~ The transmitting member~~,~~ which connects ~~for linking~~ the second planetary gear unit PR and the first planetary gear unit PU requires rigidity to withstand the reduced speed torque it transmits ~~that is input~~. For example, ~~in the case of configuring~~ a clutch that engages at a slow to medium speed and ~~or~~ a clutch that engages and disengages at a reduced speed ~~rotations~~ on the inner circumference side of the linking member, ~~the clutches~~ must have a large capacity and, therefore, must have ~~an appropriate~~ a diameter ~~to~~ correspond~~ing with~~ing to this capacity. ~~becomes necessary.~~ Therefore, in the event that the transmitting member ~~linking member is the type that passes on the outer circumference side~~ passes radially outward of this type of clutch, even ~~a~~ a larger diameter than the aforementioned necessary diameter is required ~~measurement of those clutches becomes necessary, and the diameter measurement of the linking member is enlarged more than necessary~~, and the automatic transmission as a whole will have a larger ~~becomes greater in the direction of the~~ diameter. Therefore an object of the present embodiment is to reduce the ~~enlargement of the~~ diameter ~~measurement,~~ and to provide a more compact automatic transmission.

According to the present embodiment, ~~all clutches can be configured without enlarging~~ enlargement of the diameter ~~measurement~~ of the transmitting ~~linking~~ member is avoided by mounting ~~configuring~~ a clutch C2 with a small capacity on the radially ~~linking member, particularly on the inner~~

~~circumference~~ inward side of the transmitting member 30.

Tenth Embodiment

~~Now, the~~ A tenth embodiment which is a partial modification of the ninth embodiment will now be described, with reference to Fig. 16. ~~Fig. 16 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the tenth embodiment. Now,~~ Components of the tenth embodiment which are the same as those of the ninth embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof will be omitted here, except for the partial modifications.

As Fig. 16 illustrates, the automatic transmission ~~device~~ 1_{10} of the ~~automatic transmission relating to the~~ tenth embodiment ~~is a modification of~~ has the configuration of the second planetary gear unit PR and that of the clutch C3 ~~,~~ modified as compared to that of the automatic transmission ~~device 1_9 of the automatic transmission~~ of the first embodiment (see Fig. 15).

The clutch C3 is ~~configured~~ located on the ~~opposite~~ side of the second planetary gear unit ~~PU~~ PR (left side of diagram) opposite ~~of~~ the first planetary gear unit PU. ~~within this automatic transmission device 1_{10}.~~ The inner circumferen~~ce side~~tial surface of ~~the~~ a front ~~edge~~ portion of the drum~~-shaped member~~ 25 of this clutch C3 is splined to the friction plates 73 which are intermeshed with ~~, and the inner circumference side of this~~ friction plates 72 ~~is~~ splined to the hub unit 26. The drum ~~shaped member~~ 25 is connected to the input shaft 2, and the

hub unit 26 is connected to the sun gear S1. Further, the clutch C2, comprising a hydraulic ~~oil pressure~~ servo 12, ~~a~~ friction plates 72, a drum~~-shaped member~~ 23, and a hub unit 24, is located radially inward ~~configured on the inner circumference side~~ of the ~~above-mentioned~~ clutch C3, that is to say, is located ~~enclosed~~ within the hub unit 26.

~~On the other hand,~~ On the outer circumference side of the first planetary gear unit PU is located ~~configured~~ a multi-disc brake B1 that comprises a hydraulic ~~an oil pressure~~ servo 14 and ~~a~~ friction plates 74. The side plate of the carrier CR1 of this second planetary gear unit PR is fixed to and supported by the case 3. Further, the ring gear R1 is connected to the transmitting member 30, and the friction plates 74 of the brake B1 ~~is~~ are splined ~~with~~ to the outer circumferential surface ~~side~~ of this transmitting member 30, which ~~and this transmitting member 30~~ is connected to the sun gear S3.

The operations of the automatic transmission ~~device~~ 1_{10}, ~~based on the above construction,~~ are similar to those of the third embodiment (see Fig. 6 and Fig. 7), and, accordingly, description thereof will not be repeated here ~~omitted~~.

As described above, according to the automatic transmission ~~device~~ 1_{10} of the tenth embodiment ~~relating to the present invention~~, due to the second planetary gear unit PR and the clutch C2 being located ~~configured~~ on one side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C1 being located on the axially opposite ~~configured~~

~~on the other side in the axial direction~~ of the first planetary gear unit PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be ~~configured~~ positioned more closely together, as compared to the case wherein for example two clutches C1 and C2 are ~~configured in~~ located between the second planetary gear unit PR and the first planetary gear unit PU, and the transmitting member 30 ~~for~~ which transmits ~~transmitting~~ the reduced speed rotation can be made relatively shorte~~ned~~r. ~~By doing so~~ In this manner, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are ~~configured~~ located on one side of the planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 93, 94) that supply the oil pressure servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed more easily, ~~and~~ the manufacturing process can be simplified and the costs ~~brought down~~ can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ located on the input shaft 2, one set of seal rings 81 and 82 seal the case 3 and connect supply of oil to the oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chambers of the ~~oil pressure~~ hydraulic servos 11 and 12 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12.

Further, the ~~oil pressure~~ hydraulic servo 13 can receive supply of oil, directly from the boss ~~unit~~ 3b which extend~~ed~~s from the case 3, without passing through other ~~parts for example~~ components, and therefore the oil ~~can~~ supply can be connected ~~oil~~ by providing one set of seal rings 84. Therefore, oil can be supplied simply by providing one set of seal rings 81 and 82, 84 each for the ~~oil pressure~~ hydraulic servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, the clutch C1 ~~is a clutch which~~ engages ~~at~~ in the relatively slow to medium speeds ~~levels~~ of first speed forward, second speed forward, third speed forward, and fourth speed forward, and therefore when this clutch C1 is released at the relatively high speeds ~~levels~~ of fifth speed forward, sixth speed forward, or first speed reverse, in particular~~ly~~ the hub unit 22 that connects this clutch C1 and the sun gear S2 rotates at a relatively high speed ~~revolution~~ or ~~revolves~~ in reverse (see Fig. 7). On the other hand, in ~~at the~~ fifth speed forward or first speed reverse the transmitting member 30 rotates at the reduce~~d~~ ~~rotation~~ speed, and in ~~at a~~ sixth speed forward the transmitting member 30 may be fixed in some cases, and a difference in speed ~~revolutions~~ is between the hub unit 22 and the transmitting member 30 can occur. However, because this clutch C1 is located on the ~~opposite~~ side of the first planetary gear unit PU ~~PR via~~ axially opposite the second planetary gear unit ~~PU~~ PR, the

hub unit 22 and the transmitting member 30 can be ~~configured~~ spaced apart from one another. In comparison with the case wherein, for example, these members are in contact due to a multi-axial configuration, a decrease~~d~~ in efficiency of the automatic transmission resulting from friction and so forth from the relative rotation of those units can be prevented.

~~Further, in the event that~~ If the clutch C3 is placed between the ring gear R1 and the sun gear S3, for example, the reduced speed rotation must be engaged and disengaged, and consequently the clutch C3 must be ~~becomes~~ relatively large, but by placing clutch C3 between the input shaft 2 and the sun gear S1, the engaging and disengaging of the rotation of the input shaft 2 ~~from~~ by this clutch C3 indirectly causes the reduced speed rotation output from the ring gear R1 of the planetary gear PR to be engaged and disengaged, and the clutch C3 can be made more compact, and therefore the automatic transmission can be made more compact.

Further, the automatic transmission ~~device~~ 1_{10} ~~according~~ of ~~to the present~~ This Tenth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be lowered, ~~and this contributes to the quietness of~~ thus allowing the vehicle ~~while~~ to run~~ning~~ more quietly at a high speed.

~~Now, in the event that~~ When a clutch is ~~configured in~~ located between the second planetary gear unit PR and the first planetary gear unit PU for example, the length of the ~~linking member (particularly the~~ transmitting member~~)~~ that links the second planetary gear unit PR ~~and~~ with the first planetary gear unit PU ~~becomes longer in the~~ is axially elongated ~~direction~~, and since ~~this linking member is for~~ it transmit~~ting~~s the reduced speed rotation, the thickness of the member must be increased so as to withstand the torque ~~this~~, and therefore ~~the~~ its weight is also increased. Therefore an object of the present invention is to provide an automatic transmission that can shorten the distance between the speed reduc~~tion~~ing second planetary gear unit and the first planetary gear unit, and thereby reduce the weight. ~~increase in weight.~~

With the ~~present~~ tenth embodiment, in particular, the clutch C2 is disposed on the ~~opposite~~ side ~~in the axial direction~~ of the second planetary gear unit ~~PU from~~ PR axially opposite the first planetary gear unit PU ~~PR~~, and therefore, provi~~ding~~sion of a clutch between the second planetary gear PR and the first planetary gear unit PU is not necessary, and the length of the ~~linking member, particularly the~~ transmitting member 30 can be made that much shorter. Therefore, ~~an increase in~~ weight of the automatic transmission as a whole can be ~~prevented~~ reduced.

~~[~~Eleventh Embodiment~~]~~

~~Now,~~ The eleventh embodiment is a partial~~ly changed from~~ modification as the ninth embodiment and will be described~~,~~ with reference to Fig.

17. ~~Fig. 17 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the eleventh embodiment~~. ~~Now,~~ Components of the eleventh embodiment which are the same as those of the ninth embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof will be omitted, except for the partial modifications.

As Fig. 17 illustrates, the automatic transmission ~~device~~ 1_{11} of the ~~automatic transmission relating to the~~ eleventh embodiment ~~is~~ has a modifi~~cation of the~~ed configuration of the clutch C2, and further, ~~configures~~ has a brake B3 instead of a clutch C3, and thereby enables the carrier CR1 of the planetary gear PR to be fixed by the brake B3, ~~compared to that of~~ in which respects it differs from the automatic transmission ~~device~~ 1_9 ~~of the automatic transmission~~ of the ninth embodiment (see Fig. 15).

Within the automatic transmission ~~device~~ 1_{11}, the brake B3 is ~~configured~~ located on the side of the second planetary gear unit PR~~, on the~~ opposite (left side of the diagram) ~~from~~ the first planetary gear unit PU. This brake B3 comprises ~~an oil pressure~~ a hydraulic servo 16, ~~a~~ friction plates 76, and a hub unit 33. Further, the clutch C2, comprising ~~an oil pressure~~ a hydraulic servo 12, ~~a~~ friction plates 72, ~~a~~ drum~~-shaped member~~ 23, and a hub unit 24, is ~~configured~~ located on the ~~inner circumference~~ radially inward side of ~~above-mentioned~~ the brake B3, that is to say, it is ~~enclosed~~ positioned within the hub unit 33. The hub unit 33 of this brake B3 is connected to ~~the~~ one side plate of

intermeshed with friction plates

~~one side~~ of the carrier CR1, and the other side plate ~~of the other side~~ of this carrier CR1 is rotatably supported by the input shaft 2 ~~so as to be capable of rotating.~~ Further, the sun gear S1 is connected to the input shaft 2 via the drum ~~-shaped member~~ 23 of the clutch C2. Also, the friction plates 74 of the brake B1 are ~~is~~ splined to ~~with~~ the outer circumferential surface ~~ce side~~ of the ring gear R1, and this ring gear R1 is connected to the ~~transmitting member 30, and is connected to the~~ sun gear S3 via this transmitting member 30.

The operations of the automatic transmission ~~device~~ 1_{11}, of this eleventh embodiment ~~based on the above construction,~~ are similar to those of the fourth embodiment (see Fig. 9 and Fig. 10), and accordingly description thereof will not be repeated here ~~omitted~~.

As described above, in ~~according to~~ the automatic transmission ~~device~~ 1_{11} of the eleventh embodiment ~~relating to the present invention~~, due to the second planetary gear unit PR and the clutch C2 being located ~~configured~~ on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C1 being located ~~configured~~ on the ~~other side in the~~ axial opposite side ~~direction~~ of the first planetary gear unit PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be located more ~~configured~~ closely together, as compared to the case wherein, for example, two clutches C1 and C2 are located ~~configured in~~ between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 30 for transmitting reduced speed rotation can be made relatively shorter ~~ed~~.

By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced.

Further, since the hydraulic ~~oil pressure~~ servos 11 and 12 are provided on the input shaft 2, the seal rings 81 and 82 seal the case 3 ~~and supply oil~~ to the oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chambers of hydraulic ~~oil pressure~~ servos 11 and 12 without providing the seal rings between, for example, the input shaft 2 and the hydraulic ~~oil pressure~~ servos 11 and 12. Therefore, oil can be supplied simply by providing the seal rings 81 and 82 as each for the oil pressure servos 11 and 12, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Because ~~Further,~~ the clutch C1 ~~is a clutch which~~ engages at the relatively slow to medium speeds ~~levels~~ of first speed forward, second speed forward, third speed forward, and fourth speed forward, ~~and therefore~~ when this clutch C1 is released at the relatively high speeds ~~levels~~ of fifth speed forward, sixth speed forward, or first speed reverse, in particular~~ly~~ the hub unit 22, that connects this clutch C1 and the sun gear S2, rotates at a relatively high speed ~~revolution~~

or ~~revolves~~ in reverse (see Fig. 10). On the other hand, in ~~at~~ ~~the~~ fifth speed forward or first speed reverse the transmitting member 30 at the reduced rotat~~ion~~es speed, and in ~~at a~~ sixth speed forward the transmitting member 30 may be fixed in some cases, and therefore there will be a difference in speeds ~~revolutions~~ between the hub unit 22 and the transmitting member 30, ~~can occur.~~ However, because this clutch C1 is located axially ~~on the~~ opposite ~~side of~~ the second planetary gear unit PR relative to ~~via~~ the first planetary gear unit PU, the hub unit 22 and the transmitting member 30 can be spaced ~~configured~~ apart from one another. In comparison with the case wherein, for example, these members are in contact due to a multi-axial configuration, a loss in ~~decreased~~ efficiency of the automatic transmission resulting from friction and so forth from the relative rotation of those units can be prevented.

Further, since the reduced speed rotation output to the first planetary gear unit PU from the second planetary gear unit PR is ~~made to be engaged and disengaged~~ controlled by the brake B3, the number of parts (for example drum-shaped members and so forth) can be reduced as compared to a ~~the~~ case wherein, for example, a clutch C3 is provided. Further, the brake B3 can connect ~~configure~~ an oil line directly with/in ~~from~~ the case 3, and therefore the configuration of the oil line can be simplified as compared to the case wherein, for example, a clutch C3 is provided.

Further, the automatic transmission ~~device~~ 1_{11} according to this eleventh ~~the present~~ embodiment is ~~a transmission device that is~~

directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be lowered, and this ~~contributes to the quietness of~~ allows the vehicle ~~while~~ to run~~ning~~ more quietly at a high speed.

~~Now, in the event that~~ When a clutch is ~~configured in~~ located between the second planetary gear unit PR and the first planetary gear unit PU for example, the length of the ~~linking member (particularly the~~ transmitting member~~)~~ that links the planetary gear units PR and ~~the planetary gear unit~~ PU ~~becomes longer in the~~ must be axially ~~direction~~ elongated, and since this ~~linking member is for~~ transmitting member transmits ~~the~~ reduced speed rotation, ~~the~~ its thickness ~~of the member~~ must be increased so as to withstand this load, and therefore ~~the~~ its weight is also increase~~s~~d. Therefore an object of the present invention is to provide an automatic transmission that can shorten the distance between the speed reduc~~tion~~ing second planetary gear unit and the first planetary gear unit, and reduce the ~~increase in~~ weight.

With th~~e~~is ~~present~~ eleventh embodiment, in particular, the clutch C2 is disposed ~~on the~~ axially opposite ~~side in the axial direction of~~ relative to the first planetary gear unit PU ~~from~~ the second planetary gear unit PR, and therefore, providing a clutch between the planetary gear units PR and ~~the planetary gear unit~~ PU is not necessary, and the

length of the ~~linking member, particularly the~~ transmitting member 30 can be made that much shorter. Therefore, ~~an increase in~~ weight of the automatic transmission as a whole can be ~~prevented~~ reduced.

Twelfth Embodiment

~~Below, the~~ A twelfth embodiment, which is a partial modification of the first embodiment, will now be described with reference to Fig. 18. ~~Fig. 18 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the twelfth embodiment. Now,~~ Components of the twelfth embodiment which are the same as those of the first embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for partial modifications.

As Fig. 18 illustrates, the automatic transmission ~~device~~ 1_{12} of the automatic transmission ~~relating to~~ of the twelfth embodiment ~~configures~~ has the second planetary gear unit PR, the clutch C3, and the brake B1 ~~are configured on the~~ located axially opposite ~~side of~~ the counter gear 5 ~~of~~ relative to the first planetary gear unit PU (left side in the drawing), ~~compared to that of the~~ and in this respect differs from the automatic transmission ~~device~~ 1_1 ~~of the automatic transmission~~ of the first embodiment (see Fig. 1).

Within the automatic transmission ~~device~~ 1_{12}, on the ~~above-mentioned~~ input shaft 2 is ~~configured~~ mounted a multi-disc clutch C2, which comprises ~~an oil pressure~~ a hydraulic servo 12, ~~a~~

friction plates 72, a clutch drum~~-shaped member~~ 23 ~~that forms a clutch drum~~, and a hub unit 24 linked ~~liked~~ to the ~~a~~ sun gear S2 on the radially inner ~~circumference~~ side.

The oil chamber of this hydraulic ~~oil pressure~~ servo 12 is connected to an oil line 2a which is formed on the above-mentioned input shaft 2, and this oil line 2a is ~~provided along one edge of the case 3, and is~~ connected to the oil line 91 in ~~of~~ the boss unit 3a, ~~which is provided on the input shaft 2 in a sleeve form.~~ Further, this oil line 91 is connected to an oil pressure control unit, not illustrated. Thus, ~~In other words,~~ Because the ~~above-mentioned~~ oil pressure servo 12 is mounted ~~configured~~ on input shaft 2, ~~an~~ oil pressure communication ~~line from~~ between the oil pressure control unit ~~, not illustrated, to~~ and the oil chamber of the hydraulic ~~oil pressure~~ servo 12 is provided ~~configured, simply~~ by ~~providing~~ one set of seal rings 81 which form a ~~to~~ seal between the boss ~~unit~~ 3a ~~of the case 3~~ and the input shaft 2.

The ~~above-mentioned~~ input shaft 2 is connected to the ~~above mentioned~~ clutch drum ~~-shaped member~~ 23, which has its ~~and on the~~ inner circumferential surface splined to ~~side of this drum-shaped member 23 is configured~~ the friction plates 72 of the clutch C2 which is operated ~~capable of engaging~~ by the oil pressure servo 12, ~~for the clutch C2, splined, and is connected wherein~~ the ~~inner~~ edges ~~circumference side of the~~ friction plates 72 of this clutch C2 are intermeshed with friction plates ~~is~~ splined to the hub unit 24, ~~Further, this hub unit 24~~ which is connected to the ~~above mentioned~~ carrier CR2.

~~On the other hand, on~~ At the other ~~side~~ end of the input shaft 2 (left end in diagram) is ~~configured~~ a multi-disc clutch C1 ~~that has an oil pressure~~ operated by a hydraulic servo 11, and including ~~a~~ friction plates 71, a ~~drum-shaped member 21 that forms a~~ clutch drum 21 and a hub unit 22 linked to a sun gear S2. ~~On~~ Adjacent the outer circumference ~~side~~ is ~~configured~~ a multi-disc clutch C3 ~~that comprises an oil pressure~~ operated by a hydraulic servo 13, and including ~~a~~ friction plates 73, and a clutch drum ~~unit~~ 25 ~~that forms a clutch drum.~~ Further, ~~on the outer circumference side~~ radially outward of the clutch drum ~~shaped member~~ 25 is ~~configured~~ a multi-disc brake B1 that comprises ~~an oil pressure~~ a hydraulic servo 14 and ~~a~~ friction plates 74.

The oil chamber of this ~~oil pressure~~ hydraulic servo 11 is connected to an oil line 2b which is formed ~~on~~ in the above-mentioned input shaft 2, and this oil line 2b is provided along the edge of the case 3 that is the opposite ~~side of that of~~ the above-mentioned boss unit 3a, and is connected to the oil line 93 of the boss ~~unit~~ 3b which is ~~provided on~~ formed as a sleeve around one end of the input shaft 2 ~~in a sleeve form~~. Therefore, ~~an~~ oil ~~line~~ pressure communication ~~from~~ between the oil pressure control unit ~~, not illustrated, to~~ and the oil chamber of the ~~oil pressure~~ hydraulic servo 11 is ~~constructed on the above-mentioned oil pressure servo 11, simply by providing~~ provided by one set of seal rings 82 ~~to~~ which form a seal between the boss unit 3b ~~of the case 3~~ and the input shaft 2.

~~Further,~~ The oil chamber of the ~~above-mentioned oil pressure~~ hydraulic servo 13 is connected to an oil line 94 ~~of~~ in the

~~above mentioned~~ boss ~~unit~~ 3b, which ~~and this oil line 94~~ is also connected to the ~~an~~ oil pressure control unit. ~~not illustrated.~~ Thus ~~In other words~~, for the ~~above mentioned~~ oil pressure servo 13, ~~an~~ oil communication between ~~line from~~ the oil pressure control unit ~~not illustrated, to~~ and the oil chamber of the oil pressure servo 13 is established ~~constructed,~~ by one set of seal rings 84 which provide a ~~to~~ seal between the boss ~~unit~~ 3b ~~of the case 3~~ and the clutch drum ~~shaped member~~ 25.

Further, the ~~above-mentioned~~ input shaft 2 is connected to the clutch ~~above-mentioned~~ drum ~~shaped~~ member 21 on the left side of the diagram, and located radially outward ~~on the inner circumference side~~ of this clutch drum ~~shaped member~~ 21 are ~~is configured~~ the friction plates 71 of the clutch C1 which is operated ~~capable of engaging~~ by the hydraulic ~~oil pressure~~ servo 11. Friction plates 71 are ~~for the clutch C1,~~ splined to the clutch drum 21 ~~and is~~ and are intermeshed with ~~connected wherein the inner circumference side of the~~ friction plates ~~71 of this clutch C1 is~~ splined to the hub unit 22, which ~~Further, this~~ hub ~~unit 22~~ is connected to the ~~above-mentioned~~ sun gear S2.

~~Further,~~ The ~~above mentioned~~ clutch drum ~~shaped member~~ 25 is rotatably supported by the ~~above mentioned~~ boss ~~unit~~ 3b ~~so as to rotate,~~ and its ~~on the~~ outer circumferen~~ce side of the~~tial surface, are front portion thereof is splined to the ~~edge of this drum-shaped member 25 is configured the~~ friction plates 74 of the brake B1 which is operated ~~capable of retaining~~ by the hydraulic ~~oil pressure~~ servo 14 ~~for the above-mentioned brake B1, splined. On~~ The inner circumferen~~ce~~tial ~~side~~ surface of the front portion ~~edge~~ of this clutch drum ~~shaped member~~ 25 is

~~configured~~ splined to the friction plates 73 of the clutch C3 which is ~~capable of engaging~~ operated by the ~~oil pressure~~ hydraulic servo 13. ~~for the clutch C3, splined, and on the inner circumference side of~~ The friction plates 73 of this clutch C3 are intermeshed with friction plates splined to the ring gear R1. ~~is splined.~~

~~Further,~~ The carrier CR1 ~~has a pinion Pa and~~ supports a pinion Pb, ~~and this pinion Pb~~ which meshes with the ~~above-mentioned~~ ring gear R1, and ~~this~~ a pinion Pa which meshes with the sun gear S1 which, in turn, is connected to the input shaft 2. ~~This~~ The carrier CR1 is secured to the boss ~~unit~~ 3b ~~of the case 3~~ via a side plate, and ~~this~~ the ring gear R1 is rotatably supported by a supporting ~~unit~~ element 26 ~~to~~ extending from the boss ~~unit~~ 3b. ~~so as to rotate.~~

Further, ~~to~~ the ~~above-mentioned~~ clutch drum ~~shaped member~~ 25 is connected to one end of a ~~linking~~ transmitting member 30 that transmits the rotation of the ring gear R1 when the clutch C3 is engaged. ~~and further, to~~ The ~~other side~~ opposite end of this transmitting member 30 is connected the sun gear S3 of the ~~above-mentioned~~ first planetary gear unit PU.

The operations of the automatic transmission ~~device~~ 1_{12}, ~~based on the above construction,~~ of this twelfth embodiment are similar to those of the first embodiment (see Fig. 2 and Fig. 3), and accordingly description thereof will not be ~~omitted.~~ repeated here.

As described above, according to the automatic transmission ~~device~~ 1_{12} ~~relating to the present invention~~ of the twelth embodiment, ~~due to~~ because the planetary gear PR and the clutch C1 ~~being~~

~~configured~~ located on one side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C2 ~~being configured~~ is located axially opposite on the ~~other~~ side ~~in the axial direction~~ of the planetary gear unit PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be ~~configured~~ located more closely together, as compared to the case wherein, for example, two clutches C1 and C2 are ~~configured in~~ located between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 30 for transmitting the reduced speed rotation can be made relatively shorte~~ned.~~r and ~~By doing so,~~ the automatic transmission can be made more compact and ~~more~~ lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are ~~configured~~ located on one side of the planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 93, 94) that supply the ~~oil pressure~~ hydraulic servos 11, 12, and 13 ~~of these clutches C1, C2, C3~~ can be constructed more easily, ~~and~~ the manufacturing process can be simplified and the costs can be reduced ~~brought down~~.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ mounted on the input shaft 2, one set of seal rings 81 and 82 provide a seal between the case 3 ~~and supply oil to the~~ oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chambers of oil pressure servos 11 and 12

without providing ~~the~~ seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Further, the ~~oil pressure~~ hydraulic servo 13 can receive supply of oil directly from the boss ~~unit~~ 3a which extend~~ed~~s from the case 3, i.e. without passing through other ~~parts for example, and therefore can supply~~ components, ~~oil~~ by provi~~ding~~sion of one set of seal rings 80. Therefore, oil can be suppl~~ied~~ secured simply by providing one set of seal rings 81 and 82, 84 each for of the ~~oil pressure~~ hydraulic servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, due to the clutch ~~C1~~ C3 being ~~configured on the~~ arranged radially outward ~~inner circumference side~~ of the clutch ~~C3~~ C1, the clutch C3, which must transmit a relatively large torque ~~in order to~~ with transmi~~t~~ssion of the reduced speed rotation, ~~can be configured on the outer circumference side, and this clutch C3 and the oil pressure~~ and its hydraulic servo 13 ~~thereof~~ can have an increased diameter, ~~Particularly~~ the pressure receiving area of the oil chamber of the ~~oil pressure~~ hydraulic servo 13 can be enlarged, and the ~~capacity capable of~~ torque transmission capacity of ~~this~~ clutch C3 can be increased. ~~By configuring~~ Further, by providing the clutch C1 ~~which can have~~ with a smaller capacity ~~for~~ torque transmission as compared to that of the clutch C3, the automatic transmission can be made more compact.

Further, because the automatic transmission ~~device~~ 1_{12} ~~according to~~ of the ~~present~~ twelfth embodiment is ~~a transmission device that is~~

directly coupled ~~at~~ in fourth speed forward, ~~Therefore, at~~ in fifth speed forward and In sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be lowered, ~~and this contributes to the quietness of the~~ thus allowing the vehicle ~~while~~ to run~~ning~~ more quietly at a high speed.

Thirteenth Embodiment

~~Below, the~~ A thirteenth embodiment, which is a partial modification of the twelfth embodiment, will now be described with reference to Fig. 19. ~~Fig. 19 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the thirteenth embodiment. Now,~~ Components of the thirteenth embodiment which are the same as those of the twelfth embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for the partial modifications.

As Fig. 19 illustrates, the automatic transmission ~~device~~ 1_{13} of the ~~automatic transmission relating to the~~ thirteenth embodiment ~~is a modification of~~ has the configuration of the second planetary gear unit PR, the clutch C1, and the clutch ~~C1~~ C3 modified ~~compared to that of the automatic transmission device 1_{12} of the automatic transmission of the~~ relative to the twelfth embodiment (see Fig. 18).

In this thirteenth embodiment ~~The~~ the clutches C1 and ~~the clutch~~ C3 are located ~~is configured~~ on the side of the second PR planetary gear unit ~~PU side~~ (left side of diagram) opposite ~~of~~ the first planetary gear PU ~~PR within this automatic transmission device~~ ~~1_{13}~~. The inner surface ~~circumference side~~ of a ~~the~~ front portion ~~edge~~ of the drum ~~-shaped member~~ 25 of this clutch C3 is splined to the friction plates 73 which are intermeshed with ~~, and the inner circumference side of this~~ friction plates ~~73 is~~ splined to the hub unit 26. The clutch drum ~~shaped member~~ 25 is connected to the input shaft 2, and the hub unit 26 is connected to the sun gear S1. Further, the clutch C1 comprising a hydraulic ~~oil pressure~~ servo 12, ~~a~~ friction plates 71, a clutch drum ~~-shaped member,~~ 21, and a hub unit 22 is located radially inward ~~configured on the inner circumference side~~ of the ~~above-mentioned~~ clutch C3, that is to say, is enclosed within the hub unit 26.

Radially outward of ~~On the other hand, on the outer circumference side of~~ the second planetary gear unit PR is ~~configured~~ a multi-disc brake B1 that comprises a hydraulic ~~an oil pressure~~ servo 14 and ~~a~~ friction plates 74. The side plate of the carrier CR1 of the second ~~this~~ planetary gear unit PR is fixed to and supported by the case 3. Further, the ring gear R1 is connected to the transmitting member 30, and the friction plates 74 of the brake B1 are ~~is~~ splined to ~~with~~ the outer circumferential surface ~~side~~ of ~~this~~ transmitting member 30, which, in turn ~~and this transmitting member 30~~ is connected to the sun gear S3.

The operations of the automatic transmission ~~device~~ 1_{13}, ~~based on the above construction,~~ are similar to those of the

third embodiment (see Fig. 6 and Fig. 7)~~,~~ and accordingly description thereof will not be ~~omitted.~~ repeated here.

As described above, ~~according to~~ in the automatic transmission ~~device~~ 1_{13} of the thirteenth embodiment ~~relating to the present invention~~, because ~~due to~~ the second planetary gear unit PR and the clutch C1 ~~being~~ are located ~~configured~~ on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 is located on the axially ~~being configured~~ opposite side ~~on the other side in the axial direction~~ of the first planetary gear unit PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be located more ~~configured~~ closely together, as compared to a transmission ~~the case~~ wherein, for example, two clutches C1 and C2 are located ~~configured in~~ between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 30 for transmitting reduced speed rotation can be made relatively shorte~~ned~~r. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are located ~~configured~~ on one side of the first planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 93, 94) that supply the hydraulic ~~oil pressure~~ servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed more easily, ~~and~~ the manufacturing process can be simplified and the costs can be reduced ~~brought down~~.

thereby connect

Further, since the hydraulic ~~oil pressure~~ servos 11 and 12 are mounted ~~provided~~ on the input shaft 2, one set of seal rings 81 and 82 serve to ~~seal the case 3~~ to input shaft 2 and supply of oil to the oil lines 2a and 2b provided within input shaft 2. ~~and therefore~~ Thus, oil can be supplied to the oil chambers of hydraulic ~~oil pressure~~ servos 11 and 12 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the hydraulic ~~oil pressure~~ servos 11 and 12. Further, the hydraulic ~~oil pressure~~ servo 13 can be supplied with ~~supply~~ oil from the boss unit 3b extended from the case 3, without passing through other components ~~parts for example~~, ~~and therefore can supply oil~~ by providing one set of seal rings 84. Because ~~Therefore,~~ oil can be supplied ~~simply~~ by providing one set of seal rings 81 and 82, 84 each for of the hydraulic ~~oil pressure~~ servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, because the clutch C1 is located radially inward ~~configured on the inner circumference side~~ of the clutch C3, the clutch C3, which must transmit a relatively large torque in order to transmit the reduced speed rotation, can be located ~~configured~~ on the outer circumference side, and therefore ~~this~~ clutch C3 and the oil pressure servo 13 thereof can have an increased diameter. In particular ~~ly~~, the pressure-receiving area of the oil chamber of the oil pressure servo 13 can be enlarged, and the ~~capacity capable of~~ torque transmission capacity of ~~this~~ clutch C3 can be increased.

Further, by designing ~~By configuring~~ the clutch C1 ~~which can~~ to have a smaller capacity ~~for~~ torque transmission as compared to the clutch C3, the automatic transmission can be made more compact.

In contrast ~~Further~~, for example, if the clutch C3 were to be ~~is~~ placed between the ring gear R1 and the sun gear S3, the reduced speed speed, high torque rotation it would ~~must be~~ engage~~d~~ and disengage~~d~~, and would need to be ~~becomes~~ relatively large. However, by locating clutch C3 ~~but by placing~~ between the input shaft 2 and the sun gear S1, ~~the~~ engag~~ing~~ement and disengag~~ing~~ement of ~~the rotation of the input shaft 2 from~~ this clutch C3 indirectly causes the reduced speed rotation output from the ring gear R1 of the second planetary gear unit PR to be engaged and disengaged, and therefore the clutch C3 can be made more compact, and ~~therefore~~ the automatic transmission as a whole can be made more compact.

Further, the automatic transmission ~~device~~ 1_{13} ~~according to~~ of the ~~present~~ thirteenth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, at fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and, particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be lowered, ~~and this contributes to the quietness of the~~ thus allowing the vehicle ~~while~~ to run~~ning~~ more quietly at a high speed.

~~Now, in the event that~~ If a clutch is ~~configured in~~ located between the planetary gear units PR and ~~the planetary gear unit~~ PU ~~for example~~, the length of the ~~linking member (particularly~~

~~the~~ transmitting members that links the planetary gear units PR and ~~the planetary gear unit~~ PU must by ~~becomes longer in the~~ axially elongated ~~direction~~, and since this ~~linking member is for~~ transmitting member receives speed the reduced rotation, the thickness of the member must be increased so as to withstand the high torque ~~this~~, and therefore the weight is also increased. Therefore an object of the present invention is to provide an automatic transmission that can shorten the distance between the ~~speed reduction~~ planetary gear ~~and the planetary gear~~ units, and thereby prevent ~~reduce the~~ increase in weight.

In this thirteenth ~~With the present~~ embodiment, because ~~in particular,~~ the clutch C1 is disposed on the ~~opposite~~ side ~~in the axial direction~~ of the planetary gear unit PR axially opposite ~~PU from~~ the planetary gear unit PU ~~PR~~, ~~and therefore~~, provision of ~~providing~~ a clutch between the planetary gear units PR and ~~the planetary gear unit~~ PU is not necessary, and the ~~length of the linking member, particularly the~~ transmitting member 30 can be made that much shorter. Therefore, an increase in weight of the automatic transmission as a whole can be avoided ~~prevented~~.

Fourteenth Embodiment

~~Below, the~~ A fourteenth embodiment, which is a partial modification of the twelfth embodiment, will now be described with reference to Fig. 20. ~~Fig. 20 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the~~

~~fourteenth embodiment. Now,~~ Components of the fourteenth embodiment which are the same as those of the twelfth embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except for partial modifications.

As Fig. 20 illustrates, the automatic transmission ~~device~~ 1_{14} ~~of the automatic transmission relating to~~ of the fourteenth embodiment ~~is a modification of~~ differs from that the twelfth embodiment in the configuration of the clutch C2, ~~and further, configures~~ in having a brake B3 instead of a clutch C3, and in enabling the carrier CR1 of the planetary gear PR to be fixed by the brake B3. ~~compared to that of the automatic transmission device 1_{12} of the automatic transmission of the twelfth embodiment (see Fig. 18)~~.

Within the automatic transmission ~~device~~ 1_{14}, the brake B3 is ~~configured~~ located on the side of the planetary gear unit PR, axially ~~on the~~ opposite (left side on the diagram) ~~from~~ the planetary gear unit PU. This brake B3 comprises ~~an oil pressure~~ a hydraulic servo 16, ~~a~~ friction plates 76, and a hub unit 33. ~~Further,~~ The clutch C1~~,~~ comprises a hydraulic servo 11, ~~a~~ friction plates 71, a clutch drum ~~shaped member~~ 21, and a hub unit 22, and is located ~~configured on the inner circumference side~~ radially inward of ~~above mentioned~~ the brake B3, ~~that is to say, is~~ enclosed within the hub unit 33. The hub unit 33 of this brake B3 is connected to ~~the~~ one side plate of ~~one side of~~ the carrier CR1, and the other side plate of the ~~other side of this~~ carrier CR1 is rotatably supported by the input shaft 2.

~~so as to be capable of rotating.~~ Further, the sun gear S1 is connected to the input shaft 2 via the drum~~-shaped member~~ 21 of the clutch C1. ~~Also,~~ The friction plates 74 of the brake B1 ~~is~~ are intermeshed with friction plates splined ~~with~~ to the outer circumferen~~ce side~~tial surface of the ring gear R1, and this ring gear R1 is connected to the ~~transmitting member 30, and is connected to the~~ sun gear S3 ~~via this~~ by transmitting member 30.

The operations of the automatic transmission ~~device~~ 1_{14} of this fourteenth embodiment ~~based on the above construction,~~ are similar to those of the fourth embodiment (see Fig. 9 and Fig. 10), and accordingly description thereof will not be ~~omitted~~ repeated here.

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_{14} ~~relating to the present invention~~ of the fourteenth embodiment, due to the planetary gear PR and the clutch C1 being ~~configured~~ located on one side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C2 being ~~configured on the other side in~~ located on the axially opposite side ~~direction~~ of the planetary gear unit PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be ~~configured~~ located more closely together as compared to ~~the case wherein~~ a transmission wherein for example two clutches C1 and C2 are ~~configured in~~ located between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 30 for transmitting reduced speed rotation can be made relatively shorte~~ned~~r. ~~By doing so~~ In this manner, the automatic transmission can be made more compact and more lightweight. Further, because the inertia

force ~~of~~ inertia can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to ~~the case~~ a transmission wherein three clutches C1, C2, C3 are ~~configured~~ located on one side of the planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 93) that supply ~~the~~ oil to the ~~pressure~~ hydraulic servos 11 and 12 of these clutches C1 and C2, can be more constructed easily, ~~and~~ the manufacturing process can be simplified and the costs ~~brought down~~ can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are provided on the input shaft 2, the seal rings 81 and 82 seal the case 3 ~~and supply oil~~ to the oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chambers of ~~oil pressure~~ hydraulic servos 11 and 12 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Therefore, the oil supply can be ~~supplied~~ connected simply by providing the seal rings 81 and 82 each for of the ~~oil pressure~~ hydraulic servos 11 and 12, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, since output of the reduced speed rotation ~~output~~ to the first planetary gear unit PU from the second planetary gear unit PR is ~~made to be engaged and disengaged~~ controlled by the brake B3, the number of parts (for example drum-shaped members ~~and so forth~~) can be

reduced as compared to embodiments having ~~the case wherein, for example, a~~ clutch C3 ~~is provided.~~ Further, the brake B3 can connect ~~configure~~ an oil line directly to/in ~~from~~ the case 3, and therefore the configuration of the oil line can be simplified as compared to the embodiments including ~~case wherein, for example,~~ a clutch C3. ~~is provided.~~

Further, the automatic transmission ~~device~~ 1_{14} ~~according~~ of ~~to~~ the fourteenth ~~present~~ embodiment is ~~a transmission device that is~~ directly coupled in ~~at~~ fourth speed forward. Therefore, in ~~at~~ fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine speed ~~revolutions~~ can be lowered, thereby allowing ~~and this contributes to the quietness of~~ the vehicle to ~~while~~ run~~ning~~ more quietly at ~~a~~ high speed.

~~Now, in the event that~~ If a clutch is located ~~configured in~~ between the planetary gear units PR and ~~the planetary gear unit~~ PU ~~for example~~, the length of ~~the linking member (particularly~~ the transmitting members ~~)~~ that links the planetary gear units PR and ~~the planetary gear unit~~ PU must be ~~becomes longer in the~~ axially elongated ~~direction~~, and because ~~since~~ this ~~linking~~ member ~~is for~~ transmits ~~transmitting~~ the reduced speed rotation, its ~~the~~ thickness ~~of the member~~ must be increased so as to withstand the transmitted torque ~~this~~, and therefore its ~~the~~ weight must be also increased. Therefore an object of the present invention is to provide an automatic transmission that can reduce ~~shorten~~ the distance between the ~~speed reduction~~ planetary units PU and PR,

~~gear and the planetary gear unit~~, and to thereby minimize the ~~reduce the increase in~~ weight of the transmitting member.

In ~~With~~ the ~~present~~ fourteenth embodiment, in particular, the clutch C1 is disposed on the ~~opposite~~ side ~~in the axial direction~~ of the second planetary gear unit PR opposite ~~PU from~~ the first planetary gear unit PU ~~PR~~, and therefore, providing a clutch between the planetary gear units PR and ~~the planetary gear unit~~ PU is not necessary, and the length of the ~~linking member, particularly the~~ transmitting member 30 can be made that much shorter. Therefore, ~~an increase in~~ weight of the automatic transmission as a whole can be reduced ~~prevented~~.

Fifteenth Embodiment

~~Below,~~ The fifteenth embodiment, which is a partial modification of the previously described ~~first through fourteenth~~ embodiments will now be described~~,~~ with reference to Fig. 21 through Fig. 23. ~~Fig. 21 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the fifteenth embodiment, Fig. 22 is an operational table of an automatic transmission relating to the fifteenth embodiment, and Fig. 23 is a speed line diagram of an automatic transmission relating to the fifteenth embodiment. Now,~~ Components of the fifteenth embodiment which are the same as those of the first embodiment are ~~will be~~ denoted by ~~with~~ the same reference numerals, and description thereof will not be repeated here ~~omitted~~, except for ~~partial~~

modifications.

As illustrated in Fig. 21, ~~an~~ the automatic transmission ~~device~~ 1_{15} of ~~an automatic transmission relating to~~ the fifteenth embodiment comprises a first planetary gear unit PU and a second planetary gear unit PR on the input shaft 2, similar to ~~that of an~~ the automatic transmission ~~device~~ 1_1 of ~~an automatic transmission relating to~~ the first embodiment. The first planetary gear unit PU comprises a first simple planetary gear unit SP2 and a second simple planetary unit SP3, and is a Simpson-type planetary gear unit comprising a sun gear S2 and a sun gear S3 that are linked together, a carrier CR3 and a ring gear R2 that are linked together, a ring gear R3, and a carrier CR2, as the four rotary ~~rotation~~ components. Further, the ~~above-mentioned~~ second planetary gear unit PR is a double pinion planetary gear unit comprising a carrier CR1, ~~wherein~~ a pinion P1b which is meshed with a ring gear R1 and a pinion P1a which is meshed with a sun gear S1, wherein the pinions ~~which~~ are meshed with one another.

On the ~~above-mentioned~~ input shaft 2 is also ~~configured~~ mounted a multi-disc clutch C1, which comprises ~~an oil pressure~~ a hydraulic servo 11, ~~a~~ friction plates 71, a clutch drum ~~shaped member~~ 121 ~~that forms a clutch drum~~, and a hub unit 122. The oil chamber of this ~~oil pressure~~ hydraulic servo 11 is connected to an oil line 91 of the boss ~~unit~~ 3a which ~~is provided on~~ forms a sleeve around one end of the input shaft 2 ~~in a sleeve form and is provided along one edge of the case 3,~~ and this oil line 91 is connected to an oil pressure control

unit, not illustrated. In other words, an oil line from the oil pressure control unit, not illustrated, to the oil chamber of the oil pressure servo 11 is ~~configured,~~ connected simply by providing one set of seal rings 81 which form a ~~to~~ seal between the boss ~~unit~~ 3a ~~of the case 3~~ and the drum~~-shaped member~~ 121.

The ~~above-mentioned~~ input shaft 2 is connected to the ~~above-mentioned~~ clutch drum~~-shaped member~~ 121, and ~~on~~ the inner ~~circumference side~~ surface of this drum~~-shaped member~~ 121 is splined ~~configured~~ to the friction plates 71 of the clutch C1 which ~~is~~ are intermeshed ~~capable of engaging by the oil pressure servo 11 for the clutch C1, splined, and is connected wherein the inner circumference side of the~~ with friction plates ~~71 of this clutch C1 is~~ splined to the hub unit 122 which, in turn, ~~. Further, this hub unit 122~~ is connected to the ~~above-mentioned~~ sun gear S2.

~~On the other hand, on~~ At the other ~~side~~ end (the left of the diagram) of the input shaft 2 is ~~configured~~ a multi-disc clutch C2, which comprises ~~an oil pressure~~ a hydraulic servo 12, ~~a~~ friction plates 72, a clutch drum~~-shaped member~~ 123 ~~that forms a clutch drum~~, and a hub unit 124 ~~liked~~ linked to a carrier CR3. ~~On~~ At the outer circumference ~~side,~~ is a multi-disc clutch C3 ~~also configured,~~ which comprises ~~an oil pressure~~ a hydraulic servo 13, ~~a~~ friction plates 73, and a clutch drum~~-shaped member~~ 125. ~~that forms a clutch drum.~~ Further, ~~on the outer circumference side~~ radially outward of the clutch drum~~-shaped member~~ 125 is ~~configured~~ a multi-disc brake B1 which comprises ~~an oil pressure~~ a hydraulic servo 14 and ~~a~~ friction

plates 74.

The oil chamber of this hydraulic ~~oil pressure~~ servo 12 is connected to an oil line 2b which is formed on the ~~above-mentioned~~ input shaft 2, and this oil line 2b extends ~~is provided~~ along the edge of the case 3 that is ~~the~~ opposite ~~side of that of~~ the above-mentioned boss ~~unit~~ 3a, and is connected to the oil line 93 of the boss ~~unit~~ 3b which is forms a sleeve ~~provided on~~ around the input shaft 2, ~~in a sleeve form~~. Therefore, an oil line from the oil pressure control unit, not illustrated, to the oil chamber of the hydraulic ~~oil pressure~~ servo 12, is connected ~~constructed on the above-mentioned oil pressure servo 12,~~ simply by providing one set of seal rings 82 to form a seal between the input shaft 2 and the clutch drum ~~-shaped member~~ 23.

Further, the oil chamber of the hydraulic ~~above-mentioned oil pressure~~ servo 13 is connected to an oil line 94 of the ~~above-mentioned~~ boss ~~unit~~ 3b, which ~~and this~~ oil line 94 is connected to the ~~an~~ oil pressure control unit, ~~not illustrated.~~ In other words, for the above-mentioned hydraulic ~~oil pressure~~ servo 13, an oil line from the oil pressure control unit, ~~not illustrated,~~ to the oil chamber of the oil pressure servo 13 is connected ~~constructed,~~ by one set of seal rings 84 ~~to seal~~ between the boss ~~unit~~ 3b ~~of the case 3~~ and the clutch 125. drum ~~-shaped member 125.~~

~~Further,~~ The ~~above-mentioned~~ input shaft 2 is connected to the ~~above-mentioned~~ ~~drum-shaped member~~ 123 on the left

side of the diagram, and ~~on~~ the inner surface ~~circumference side~~ of this drum-shaped member 123 is splined to ~~configured~~ the friction plates 72 of the clutch C2 which is operated by the ~~is capable of engaging by the oil pressure~~ hydraulic servo 12. ~~for the clutch C2, splined, and is connected wherein the inner circumference side of the~~ The friction plates 72 are intermeshed with friction plates ~~of this clutch C2 is~~ splined to the hub unit 124, which ~~Further, this~~ hub unit 124 is connected to the ~~above-mentioned~~ carrier CR3.

~~Further, the above-mentioned~~ The clutch drum ~~-shaped member~~ 125 is rotatably supported by the ~~above-mentioned~~ boss ~~unit~~ 3b ~~so as to rotate~~, and ~~on~~ the outer surface ~~circumference side~~ of a ~~the~~ front edge of this clutch drum ~~-shaped member~~ 125 is splined to ~~configured the~~ friction plates 74 of the brake B1 which is operated by ~~capable of retaining by the oil pressure~~ hydraulic servo 14. ~~for the above-mentioned brake B1, splined. On~~ The inner surface ~~circumference side~~ portion of the front ~~edge~~ of ~~this~~ drum ~~-shaped member~~ 125 is splined to ~~configured~~ the friction plates 73 of the clutch C3 which is operated ~~capable of engaging~~ by the hydraulic ~~oil pressure~~ servo 13. ~~for the clutch C3, splined, and on the inner circumference side of~~ The friction plates 73 are intermeshed with friction plates splined to ~~of this clutch C3~~ the ring gear R1. ~~is splined.~~

~~Further,~~ The carrier CR1 supports ~~comprises~~ a pinion P1a and a pinion P1b. ~~and this~~ Pinion P1b meshes with the ~~above-mentioned~~ ring gear R1, and ~~this~~ pinion P1a meshes with the sun gear S1 which is connected to the input shaft 2. ~~This~~

Carrier CR1, in turn, is secured to the boss ~~unit~~ 3b of the case 3 via a side plate, and ~~this~~ ring gear R1 is rotatably supported by a supporting ~~unit~~ element 126 fixed to the boss ~~unit~~ 3b, ~~so as to rotate.~~

~~Further, to the above-mentioned~~ The drum~~-shaped member~~ 125 is connected to a ~~linking~~ transmitting member 130 that ~~transmits~~ receives the rotation of the ring gear R1 when the clutch C3 is engaged, and, further, ~~to~~ the other ~~side~~ end of this transmitting member 130 is connected the ring gear R3 of the second simple planetary gearing SP3 of the ~~above mentioned~~ first planetary gear unit PU.

~~On the other hand,~~ On the outer ~~circumference~~ side of the first simple planetary gearing SP2 is ~~configured~~ a one-way clutch F1, and the inner race of this one-way clutch F1 is connected to the hub unit 128 which, in turn, is connected to the ring gear R2 of the first simple planetary gearing SP1. Further, on the outer ~~circumference~~ side of this ring gear R2 is ~~configured~~ a brake B2 comprising ~~an oil pressure~~ a hydraulic servo 15 and ~~a~~ friction plates 75. The ~~inner circumference side of this~~ friction plates 75 ~~is~~ are intermeshed with friction plates splined to the ring gear R2 and the hub unit 128, and ~~also the outer circumference side of this friction plate 75 is~~ are splined to the inner ~~circumference side~~ surface of the case 3. ~~that is to say, this~~ Thus, ring gear R2 ~~is~~ can be ~~made capable of retaining~~ held against rotation by engagement of the brake B2.

Further, the carrier CR3 ~~which has~~ supports a pinion P3 ~~supported by the side plate~~ which is meshed with the inner

surface ~~circumference side~~ of the ~~above-mentioned~~ ring gear R3 ~~via this pinion P3, and this carrier CR3 is meshed~~ and with the ~~above-mentioned~~ sun gear S3. ~~via this pinion P3, and~~ The carrier CR3 is also ~~is~~ linked to the ring gear R2. ~~Further,~~ The carrier CR2 ~~which~~ supports ~~has~~ a pinion P2 ~~supported by the side plate~~ which is meshed with the inner surface ~~circumference side~~ of the ~~above-mentioned~~ ring gear R2 ~~via this pinion P2, and this carrier CR2 meshes with~~ and with ~~the above-mentioned~~ sun gear S2. ~~via this pinion P2~~. Also, this carrier CR2 is linked to the counter gear 5 via ~~this~~ side plate 127.

~~As described above,~~ The second planetary gear unit PR and the clutch C2 and C3 are located ~~configured~~ on one side ~~in the axial direction~~ of the first planetary gear unit PU, ~~and also the clutch C2 is configured on one side in the axial direction,~~ and the clutch C1 and ~~is configured on the other side in the axial direction, and~~ the counter gear 5 are located on ~~is configured in~~ the axially opposite side ~~direction~~ (right side of the diagram) of the first planetary gear unit PU. ~~of the planetary gear PR.~~ Further, the clutch C2 is disposed radially inward of ~~on the inner circumferential side~~ of the clutch C3, and radially inward ~~particularly~~ of the transmitting member 130. ~~that transmits the output thereof.~~ Further, the brake B1 is disposed radially outward of ~~configured on the outer circumference side of~~ the second planetary gear unit PR, and the brake B2 is disposed ~~configured on the~~ radially outward ~~outer circumference side~~ of the first planetary gear unit PU.

~~Continuing, based on the above-mentioned construction,~~

¶ The operations of ~~an~~ the automatic transmission ~~device~~ 1_{15} of this fifteenth embodiment will now be described~~s~~ with reference to Fig. 21, Fig. 22, and Fig. 23 below. ~~Now,~~ The vertical ax~~i~~es of the speed line diagram illustrated in Fig. 23 indicate the ~~revolutions~~ speeds of each ~~rotation~~ rotary component, and the horizontal axis indicates the corresponding gear ratio of the~~se~~ rota~~tion~~ry components. ~~Further, regarding~~ In the first planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 23) corresponds to ring gear R3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ax~~i~~es correspond~~s~~ to the ring gear R2 and the carrier CR3, the carrier CR2, and the sun gear S2 and the sun gear S3. ~~Further, regarding~~ In the second planetary gear unit PR section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 23) corresponds to sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ax~~i~~es correspond~~s~~ to the ring gear R1 and the carrier CR1. Further, the widths between these vertical axes are inversely proportional to the ~~inverse of the~~ number of teeth of each of the sun gears S1, S2, S3, and to the ~~inverse of the~~ number of teeth of each of the ring gears R1, R3. ~~Also,~~ The dotted line ~~in the~~ horizontal ~~direction~~ in the diagram illustrate~~s~~ ~~that~~ the speed of rotation ~~is~~ transmitted ~~from~~ by the transmitting member 130.

As illustrated in Fig. 21, the rotation of input shaft 2 is input to the ~~above-mentioned~~ sun gears S2 and ~~sun gear~~ S3, by engaging the clutch C1. The rotation of input shaft 2 is also input to the ~~above-mentioned~~ carrier CR3 and ring gear R2, by engaging the clutch C2. ~~and this~~ The carrier CR3 and ring gear R2 can be fixed ~~the~~ against rotation by ~~the retaining~~ engagement of the brake B2, and, further, their rotation can be limited to ~~in~~ one direction ~~is regulated~~ by the one-way clutch F1.

~~On the other hand,~~ When the rotation of the input shaft 2 is input to the ~~above-mentioned~~ sun gear S1, and the ~~rotation of the above-mentioned~~ carrier CR1 is fixed ~~as~~ to the case 3, ~~and~~ the ~~above-mentioned~~ ring gear R1 rotates ~~with~~ at a reduced speed ~~rotations based on the rotation of the input shaft 2 which is input to this sun gear S1 via this carrier CR1~~. The reduced speed rotation of the ring gear R1 is input to the ~~above-mentioned~~ ring gear R3 via the transmitting member 130 by engag~~ing~~ement of the clutch C3. Further, the ~~rotation of the this~~ ring gear R3 may be fixed against rotation by ~~retaining with~~ engagement of the brake B1. ~~Also,~~ The rotation of the ~~above-mentioned~~ carrier CR2 is output to the ~~above-mentioned~~ counter gear 5 and ~~is output~~ to the drive wheels via this counter gear 5, a counter shaft ~~unit~~ (not illustrated), and a differential unit.

~~At~~ In first speed forward within the D (drive) range, as illustrated in Fig. 22, the clutch C1 and the one-way clutch F1 are engaged. Then, as illustrated in Fig. 23, the

rotation of input shaft 2 is input to the sun gears S2 and ~~the sun gear~~ S3 via the clutch C1, and the rotation of the carrier CR3 and the ring gear R2 is limited to ~~regulated in~~ one direction (the forward rotation direction) of. ~~in other words, the ring gear R2 is prevent from rotating in the opposite direction and is fixed.~~ ~~Further, the~~ With rotation of the input shaft 2 ~~that is~~ input to the sun gear S2 and the reduced speed rotation ~~is~~ output to the carrier CR2 via the fixed ring gear R2, ~~and~~ the forward rotation for first speed forward is output from the counter gear 5.

No 4 ~~Now,~~ At this time, within the second planetary gear unit PR, the reduced speed rotation is output to the ring gear R3 via the sun gear S1 (which receives ~~wherein~~ the rotation of the input shaft 2) ~~is input,~~ and the fixed carrier CR1, however, the transmitting member 130 ~~in particular~~ does not transmit torque, because the clutch C3 is released. Further, when downshifting (when coasting), the brake B2 is engaged ~~retained~~ and the ring gear R2 is fixed to maintain ~~and the above-mentioned state of~~ first speed forward ~~is maintained~~ while preventing ~~the~~ forward rotation of ~~this~~ ring gear R2.

Further, in ~~this~~ first speed forward, the one-way clutch F1 prevents the ring gear R2 from rotating in ~~the opposite direction and~~ reverse while allowing forward rotation, and therefore, switching from a non-driving range to a driving range and achieving ~~the~~ first speed forward can be

accomplished more smoothly by the automatic engaging of the one-way clutch.

~~At~~ In second speed forward within ~~a~~ D (drive) range, as illustrated in Fig. 22, the clutch C1 and brake B1 are engaged. ~~Then,~~ As illustrated in Fig. 23, the rotation of input shaft 2 is input to the sun gears S2 and ~~the sun gear~~ S3 via the clutch C1, and the ~~rotations of the~~ ring gear R3 ~~are~~ is fixed against rotation. Also, reduced speed rotation is output to the carrier CR3 and the ring gear R2 via the rotation of the input shaft 2 that is input to the sun gear S3 and the fixed ring gear R3. ~~A~~ ~~reduced~~ Rotation at a speed reduced from ~~greater than~~ that of the above-mentioned first speed forward is input to the carrier CR2, via the rotation of the input shaft 2 input to the sun gear S2 and the reduced speed rotation input to ~~this~~ ring gear R2, and the forward rotation for second speed forward is output from the counter gear 5.

No¶ → ~~Now,~~ At this time, within the second planetary gear unit PR, the reduced speed rotation is output to the ring gear R3 via the sun gear S1, ~~wherein~~ which receives the rotation of the input shaft 2 ~~is input~~, and the fixed carrier CR1; however, the transmitting member 130 ~~in particular~~ does not transmit torque because the clutch C3 is released.

~~At~~ In third speed forward within the D (drive) range, as illustrated in Fig. 22, the clutches C1 and ~~the clutch~~ C3 are engaged. ~~Then,~~ As illustrated in Fig. 23, the rotation of

input shaft 2 is input to the sun gear S1 and to the ring gear R1 ~~reduces rotation speed from~~ through the fixed carrier CR1. The ring gear R1, now rotating at a ~~Further, the speed~~ reduc~~tion~~ed speed, outputs its reduced speed ~~rotation of this ring gear R1 is output~~ rotation to the ring gear R3 via the transmitting member 130, ~~from~~ with the clutch C3 engag~~ing.~~ed ~~On the other hand,~~ The rotation of the input shaft 2 is also input to the sun gear S2, and a slightly greater, but reduced speed rotation is output to the carrier CR3 and to the ring gear R2 via ~~from the rotation of the input shaft 2 input to this~~ sun gear S3 and the reduced speed rotation~~s~~ of the ring gear R3. A reduced speed rotation greater than that of the above-mentioned second speed forward is output to the carrier CR2 from the rotation of the input shaft 2 input to the sun gear S2 and the slightly greater but reduced speed rotation input to ~~this~~ ring gear R2, and the forward rotation for third speed forward is output from the counter gear 5. In this case, because the ring gear R1 and the ring gear R3 are rotating at a reduced speed ~~rotation~~, the ~~above-mentioned~~ transmitting member 130 carries ~~performs~~ a relatively large torque. ~~transmission~~.

~~At~~ In fourth speed forward within ~~a~~ D (drive) range, as illustrated in Fig. 22, the clutches C1 and ~~the clutch~~ C2 are engaged. Then, as illustrated in Fig. 23, the rotation of input shaft 2 is input to the sun gears S2 and ~~the sun gear~~ S3 via the clutch C1, and to the carrier CR3 and the ring gear R2 via the clutch C2 To establish ~~. Therefore, by the rotation of~~

~~the input shaft 2 input to the~~ sun gear S2 ~~and the rotation of input shaft 2 input to the ring~~ gear R2, in ~~other words, in the state of~~ a directly coupled ~~rotation,~~ state wherein the rotation of the input shaft 2 is output as is into the carrier CR2, and the forward rotation for fourth speed forward is output from the counter gear 5. ~~Now, a~~ At this time, within the second planetary gear unit PR, the reduced speed rotation is output to the ring gear R3 via the sun gear S1 (~~wherein~~ which receives the rotation of the input shaft 2) ~~is input,~~ and the fixed carrier CR1. However, the transmitting member 130 ~~in particular~~ does not transmit torque, because the clutch C3 is released.

~~At the~~ In fifth speed forward within the D (drive) range, as illustrated in Fig. 22, the clutches C1 and ~~the clutch~~ C3 are engaged. Then, as illustrated in Fig. 23, the rotation of input shaft 2 is input to the sun gear S1, and the ring gear R1 reduces ~~rotation~~ the speed of rotation received through ~~from~~ the fixed carrier CR1. Further, the ~~speed~~ reduc~~tion~~ed speed rotation of this ring gear R1 is output to the ring gear R3 via the transmitting member 130, ~~from~~ with the clutch C3 engag~~ing~~ed. ~~On the other hand,~~ The rotation of the input shaft 2 is also input to the carrier CR3 and the ring gear R2, and ~~an~~ overdrive speed rotation is output to the sun gear S2 and ~~the sun gear~~ S3. ~~from the rotation of the input shaft 2 input to this carrier CR3 and the reduced rotations of the ring gear R3. Also, an~~ Overdrive rotation is also output to the carrier CR2 from the

rotation of the input shaft 2 input to the ring gear R2 and ~~the overdrive rotation input~~ to ~~this~~ sun gear S2, and the forward rotation for fifth speed forward is output from the counter gear 5. In this case, because the ring gear R1 and the ring gear R3 are rotating at a reduced speed ~~rotation~~, the ~~above-mentioned~~ transmitting member 130 trasmits ~~performs~~ a relatively large torque. ~~transmission.~~

In ~~At~~ sixth speed forward within the D (drive) range, as illustrated in Fig. 22, the clutch C2 ~~is engaged~~ and the brake B1 are engaged ~~is retained~~. Then, as illustrated in Fig. 23, the rotation of the input shaft 2 is input to the carrier CR3 and to the ring gear R2 via the clutch C2, and ~~also~~ the ring gear R3 is fixed by engagement of ~~retaining~~ the brake B1. This produces ~~causes an~~ overdrive rotation (even greater than that of the above-mentioned fifth speed forward), ~~from the rotation of the input shaft 2 input to the carrier CR3 and the fixed ring gear R3, and~~ which is output to the sun gears S3 and ~~the sun gear~~ S2. From the rotation of the input shaft 2 input to the ring gear R2 and the increased rotation speed input to ~~this~~ sun gear S2, a raised ~~greater~~ speed rotation, higher than that of the above-mentioned fifth speed forward, is output ~~and the forward rotation for~~ as sixth speed forward ~~is output~~ from the counter gear 5. ~~Now,~~ At this time, within the second planetary gear unit PR, the reduced speed rotation is output to the ring gear R3 via the sun gear S1 (which receives ~~wherein~~ the rotation of the input shaft

2) ~~is input~~ and the fixed carrier CR1. however, the transmitting member 130 ~~in particular~~ does not transmit torque, because the clutch C3 is released.

In ~~At~~ first speed reverse ~~within an R (reverse) range~~, as illustrated in Fig. 22, the clutch C3 ~~is engaged~~ and the brake B2 are engaged ~~is retained~~. In this manner, ~~Then~~, as illustrated in Fig. 23, the rotation of the input shaft 2 is input to the sun gear S1, and the ring gear R1 rotates at reduced speed rotation~~s~~ via ~~from~~ the fixed carrier CR1. Further, because the clutch C3 is engaged, the reduced speed rotation~~s~~ of ~~this~~ ring gear R1 is input to the ring gear R2 via the ~~above-mentioned~~ transmitting member 130. Further ~~On the other hand~~, because the brake B2 is engaged ~~retained~~, the ~~rotation of the~~ carrier CR3 and the ring gear R2 are ~~is~~ fixed against rotation, and ~~a~~ reverse rotation is output to the sun gear S3 and the sun gear S3 because of the fixed carrier CR3 and the reduced speed rotation of the ring gear R3. ~~Then, a~~ Reverse rotation is output to the carrier CR2, with ~~from the fixed~~ ring gear R2 fixed and the reverse rotation input to ~~this~~ sun gear S2, and the ~~forward~~ rotation for first speed reverse is output from the counter gear 5. ~~Now,~~ In ~~this case~~ reverse, similar ~~to that of the above-mentioned~~ third speed forward and ~~of~~ fifth speed forward, the ring gears R1 and ~~the ring gear~~ R3 are rotating at a ~~with~~ reduced speed ~~rotations~~, and, accordingly, the ~~above-mentioned~~ transmitting member 130 transmits ~~performs~~ a relatively large torque. ~~transmission~~

~~At the~~ In P (parking) range and ~~the~~ N (neutral) range, the clutches C1, ~~clutch~~ C2, and ~~clutch~~ C3 are released ~~in particular~~, the ~~transmission movement between~~ the input shaft 2 ~~and~~ the counter gear 5 is disconnected from, and the automatic transmission ~~device~~ 1_{15} as a whole is in an idle state (neutral state).

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_{15} ~~relating to the present invention,~~ of this fifteenth embodiment ~~due to~~ because the second planetary gear unit PR and the clutch C2 ~~being~~ are ~~configured~~ located on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C1 ~~being configured~~ is located on the ~~on the other~~ axially opposite side ~~in the axial direction~~ of the first planetary gear unit PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be ~~configured~~ located more closely together, compared to ~~the~~ a ~~case~~ transmission wherein, for example, two clutches C1 and C2 are ~~configured in~~ located between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 130 ~~for transmitting reduced rotation~~ can be made relatively shorte~~ned~~r. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are ~~configured~~ located on one side of the planetary gear unit PU, the

oil lines (for example, 2a, 2b, 91, 93, 94) that supply the hydraulic ~~oil pressure~~ servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed easily, ~~and~~ the manufacturing process can be simplified and the costs can be reduced ~~brought down~~.

~~Further, since~~ Because the hydraulic ~~oil pressure~~ servos 11 and 12 are mounted ~~provided~~ on the input shaft 2, one set of seal rings 81 and 82 form a connection to ~~seal~~ the case 3 ~~and~~ for supply of oil to the oil lines 2a and 2b ~~provided~~ within input shaft 2, and therefore oil can be supplied to the oil chambers of hydraulic ~~oil pressure~~ servos 11 and 12 without providing seal rings between, for example, the input shaft 2 and the hydraulic ~~oil pressure~~ servos 11 and 12. Further, hydraulic ~~oil pressure~~ servo 13 can receive supply of oil directly from the boss ~~unit~~ 3b ~~provided from the case 3~~, i.e. without passing through ~~for example~~ other units. ~~in other words, can supply oil by providing one set of seal rings 84.~~ Therefore, oil can be supplied simply by providing one set of seal rings 81 and 82, 84 each of ~~for~~ the hydraulic ~~oil pressure~~ servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, because the clutch C2 is located radially ~~configured on the~~ inward ~~inner circumference side~~ of the clutch C3, the clutch C3, which must transmit a relatively large torque at ~~in order to transmit~~ the reduced speed ~~rotation,~~ and its ~~can be configured on the outer circumference side, and this clutch C3 and the oil~~

~~pressure~~ hydraulic servo 13 ~~thereof~~ can have an increased diameter. In ~~p~~particular~~ly~~, the pressure receiving area of the oil chamber of the ~~oil pressure~~ hydraulic servo 13 can be enlarged, and the ~~capacity capable of~~ torque transmission capacity of this clutch C3 can be increased. ~~By configuring~~ Further, the clutch C2 can be designed to ~~on the inner circumference side, which can~~ have a smaller capacity ~~for~~ torque transmission ~~compared to~~ than the clutch C3, and therefore the automatic transmission can be made more compact.

Further, the clutch C1 ~~is a clutch which~~ engages at the relatively slow to medium speeds ~~levels~~ of first speed forward, second speed forward, third speed forward, and fourth speed forward, and therefore when this clutch C1 is released at the relatively high speeds, i.e. ~~levels of~~ fifth speed forward, sixth speed forward, and ~~or~~ first speed reverse, ~~particularly~~ the hub unit 122 that connects this clutch C1 and the sun gear S2 rotates at a relatively high speed ~~revolution~~ or ~~revolves~~ in reverse (see Fig. 3). ~~On the other hand, at~~ Because in ~~the~~ fifth speed forward and ~~of~~ first speed reverse the transmitting member 130 rotates at a reduced ~~rotation~~ speed, and in ~~at a~~ sixth speed forward the transmitting member 130 may be fixed in some cases, ~~and difference in revolutions between~~ The speeds of the hub unit 122 and the transmitting member 130 can ~~occur~~ differ. However, because ~~this~~ clutch C1 is located on the ~~opposite~~ side of the first planetary gear unit PU axially opposite the second ~~PR via the~~ planetary gear unit ~~PU~~ PR, the hub unit 122 and the transmitting member 130 can be

~~configured~~ spaced apart from one another. ~~In~~ As compar~~ison~~ed with ~~the~~ a transmission ~~case~~ wherein, for example, these members are in contact due to a multi-axial configuration, decrease~~d~~ in efficiency of the automatic transmission resulting from friction and so forth from the relative rotation of those units can be ~~prevented~~ avoided.

~~Further,~~ The automatic transmission ~~device~~ 1_{15} ~~according to the present~~ of this fifteenth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be ~~lowered~~ reduced, ~~and this contributes to the quietness of~~ thereby allowing the vehicle ~~while~~ to run~~ning~~ more quietly at a high speed.

~~Now, the linking member (in particular~~ the transmitting ~~member) for~~ linking the planetary gear units PR and ~~the planetary gear unit~~ PU requires rigidity to withstand the reduced speed torque that ~~is input~~ it transmits. ~~For example, in the case of configuring~~ A clutch that engages at a slow to medium speed ~~or~~ and a clutch that engages and disengages a reduced speed rotation~~s~~ on the inner ~~circumference~~ side of the ~~linking~~ transmitting member~~, the clutches~~ must have a large capacity, and therefore a~~n~~ ~~appropriate~~ diameter ~~to~~ correspond~~with~~ing to this capacity becomes necessary. Therefore, ~~in the event that~~ if the ~~linking member is the type that~~ transmitting member passes on the outer circumferenc~~e~~ial

side of this type of clutch, an even ~~a~~ larger diameter ~~than the necessary diameter measurement of those clutches~~ becomes necessary, ~~and the diameter measurement of~~ the linking member must be ~~is~~ enlarged ~~more than necessary~~, and the automatic transmission as a whole is increased ~~becomes greater in the direction of~~ in ~~the~~ diameter. Therefore an object of the present embodiment is to allow reduction ~~reduce the enlargement~~ of the diameter ~~measurement~~, and to provide a more compact automatic transmission.

According to the present embodiment, ~~all clutches can be configured without~~ enlarg~~ing~~ement of the diameter ~~measurement~~ of the linking member is avoided, by ~~configuring~~ locating a clutch C2 with a small capacity o~~n the linking member, particularly~~ on the inner ~~circumference~~ side of the transmitting member 130.

Sixteenth Embodiment

~~Below~~, The sixteenth embodiment, which is a partial modification of the fifteenth embodiment~~,~~ will now be described, with reference to Figs. 24 through ~~Fig.~~ 26. ~~Fig. 24 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the sixteenth embodiment, Fig. 25 is an operational table of an automatic transmission relating to the sixteenth embodiment, and Fig. 26 is a speed line diagram of an automatic transmission relating to the sixteenth embodiment.~~

~~Now,~~ Components of the sixteenth embodiment which are the same as those of the fifteenth embodiment are ~~will be~~ denoted

~~with~~ by the same reference numerals, and description thereof ~~omitted~~ will not be repeated, except for ~~partial~~ modifications.

As illustrated in Fig. 24, ~~an~~ the automatic transmission ~~device~~ 1_{16} of ~~an automatic transmission relating to~~ the sixteenth embodiment ~~is a modification of~~ differs with regard to the configuration of the second planetary gear unit PR and the clutch C3, as compared to ~~that of an~~ the automatic transmission ~~device~~ 1_{15} of ~~an automatic transmission relating to~~ the fifteenth embodiment (see Fig. 21).

In this sixteenth embodiment ~~The~~ the clutch C3 is ~~configured~~ located on the planetary gear unit PU side (left side of diagram) of the second planetary gear unit PR. ~~within this automatic transmission device 1_{16}.~~ The inner ~~circumference side~~ surface of ~~the~~ a front ~~edge~~ portion of the drum~~-shaped member~~ 125 of this clutch C3 is splined to the friction plates 73, ~~and the inner circumference side of this~~ which are intermeshed with friction plates ~~that~~ splined to the hub unit 126. The drum~~-shaped member~~ 125 is connected to the input shaft 2, and the hub unit 126 is connected to the sun gear S1. ~~Further, the~~ The clutch C2 ~~comprising~~ includes a ~~oil pressure~~ hydraulic servo 12, ~~a~~ friction plates 72, a drum~~-shaped member~~ 123, and a hub unit 124 is ~~configured on the inner circumference side~~ located radially inward of the ~~above-mentioned~~ clutch C3. ~~that is to say,~~ Thus, clutch C2 is enclosed within the hub unit 126.

~~On the other hand,~~ On the radially outer ~~circumference~~ side of the second planetary gear unit PR is ~~configured~~ a multi-disc brake B1

that comprises ~~an oil pressure~~ a hydraulic servo 14 and ~~a~~ friction plates 74. The side plate of the carrier CR1 of this planetary gear unit PR is fixed to and supported by the case 3. Further, the ring gear R1 is connected to the transmitting member 130, and the friction plates 74 of the brake B1 ~~is~~ are intermeshed with friction plates splined ~~with~~ to the outer circumferen~~ce side~~tial surface of ~~this~~ transmitting member 130 which ~~and this transmitting member 130~~ is connected to the ring gear R3.

~~Continuing, based on the above-mentioned construction,~~ ¶ The operations of ~~an~~ the automatic transmission ~~device~~ 1_{16} will now be described~~,~~ with reference to Fig. 24, Fig. 25, and Fig. 26 ~~below~~. ~~Now,~~ As with the above-mentioned first embodiment, the vertical ax~~i~~es of the speed line diagram illustrated in Fig. 26 indicate~~s~~ the ~~revolutions~~ speeds of each ~~rotation~~ rotary component, and the horizontal axis indicates the corresponding gear ratio of these rota~~tion~~ry components. Further, regarding the planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 26) corresponds to ring gear R3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ax~~i~~es correspond~~s~~ to the ring gear R2 and the carrier CR3, the carrier CR2, and the sun gear S2 and the sun gear S3. Further, regarding the second planetary gear unit PR section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 26)

corresponds to sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ax~~i~~es correspond~~s~~ to the ring gear R1 and the carrier CR1. Further, the widths between these vertical axes are inversely proportional to the ~~inverse of the~~ number of teeth of each of the sun gears S1, S2, S3, and to the ~~inverse of the~~ number of teeth of each of the ring gears R1, R3. Again ~~Also~~, the dotted line ~~in the~~ horizontal ~~direction in the diagram illustrate that~~ represents the rotation ~~as~~ transmitted by ~~from~~ the transmitting member 130.

As illustrated in Fig. 24, by engaging the clutch C3, the rotation of the input shaft 2 is input to the sun gear S1. Further, the ~~rotation of the above-mentioned~~ carrier CR1 is fixed ~~as~~ to the case 3, and the ~~above-mentioned~~ ring gear R1 rotates at a reduced speed ~~rotations~~ based on the rotation of the input shaft 2 input to ~~this~~ sun gear S1. In other words, by engaging the clutch C3, the reduced speed rotation of the ring gear R1 is input to the ring gear R3 via the transmitting member 130.

Upon ~~Then,~~ As illustrated in Fig. 25 and Fig. 26, within the second planetary gear unit PR, ~~at~~ in third speed forward, fifth speed forward, and first speed reverse, the rotation of the input shaft 2 is input to the sun gear S1 by engaging the clutch C3, the reduced speed rotation is output to the ring gear R3 through ~~from~~ the fixed carrier CR1, and the reduced speed rotation is input to the ring gear R3 via the transmitting member 130. At this

time, the ring gear R1 and the ring gear R3 are rotating at a reduced speed, and therefore the ~~above-mentioned~~ transmitting member 130 transmits ~~performs~~ a relatively large torque. ~~transmission.~~ On the other hand, in ~~at~~ first speed forward, second speed forward, fourth speed forward, and sixth speed forward, the rotation of the ring gear R3 is input to the ring gear R1 via the transmitting member 130, and further, because clutch C3 is released, as illustrated in Fig. 7, the sun gear S1 rotates in accordance with the ~~based on each different~~ speed ~~level~~ of the ~~this~~ ring gear R1. ~~and the fixed carrier CR1.~~

~~Now,~~ The operations ~~actions~~ of the second planetary gear unit PR are similar to those of the above-described ~~mentioned~~ fifteenth embodiment (see Fig. 22 and Fig. 23), and accordingly description thereof will be omitted.

In ~~As described above, according to~~ the automatic transmission ~~device~~ 1_{16} of this sixteenth embodiment ~~relating to the present invention~~, because ~~due to~~ the second planetary gear unit PR and the clutch C2 are ~~being~~ located ~~configured~~ on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C1 is located ~~being configured~~ on the opposite side ~~other side in the~~ axially ~~direction~~ of the first planetary gear unit PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be located more ~~configured~~ closely together, compared to a transmission ~~the case~~ wherein, for example, two clutches C1 and C2 are located ~~configured in~~ between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 130 ~~for~~

~~transmitting reduced rotation~~ can be made relatively shorte~~ned~~. ~~By doing so~~ Thus, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to ~~the case~~ a transmission wherein three clutches C1, C2, C3 are ~~configured~~ located on one side of the first planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 93, 94) that supply the ~~oil pressure~~ hydraulic servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed more easily, ~~and~~ the manufacturing process can be simplified and the costs ~~brought down~~ can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ mounted on the input shaft 2, one set of seal rings 81 and 82 seal the case 3 to the input shaft 2 for ~~and~~ supply of oil to the oil lines 2a and 2b ~~provided within input shaft 2~~, and therefore oil can be supplied to the oil chambers of ~~oil pressure~~ hydraulic servos 11 and 12 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Further, the ~~oil pressure~~ hydraulic servo 13 can receive supply of oil directly from the boss ~~unit~~ 3a extended from the case 3, without passing through other elements. ~~parts for example, and therefore can supply oil by providing one set of seal rings 84.~~ Therefore, oil can be supplied simply by providing one set of seal rings 81 and 82, 84 each for of the ~~oil pressure~~ hydraulic servos 11, 12, and 13,

~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, the clutch C1 ~~is a clutch which~~ engages at the relatively slow to medium speeds ~~levels~~ of first speed forward, second speed forward, third speed forward, and fourth speed forward, and therefore when this clutch C1 is released at the relatively high speeds ~~levels~~ of fifth speed forward, sixth speed forward, and ~~or~~ first speed reverse, ~~particularly~~ the hub unit 122 that connects ~~this~~ clutch C1 and the sun gear S2 rotates at a relatively high speed ~~revolution~~ or ~~revolves~~ in reverse (see Fig. 3). On the other hand, in ~~at~~ the fifth speed forward and ~~or~~ first speed reverse the transmitting member 130 rotates at a reduced ~~rotation~~ speed, and in ~~at a~~ sixth speed forward the transmitting member 130 may be fixed in some cases, whereby the speeds of ~~and difference in revolutions between~~ the hub unit 122 and the transmitting member 130 may differ ~~can occur~~. However, because ~~this~~ clutch C1 is located on the ~~opposite~~ side of the first planetary gear unit PU ~~PR~~ opposite ~~via~~ the second planetary gear unit PR ~~PU~~, the hub unit 122 and the transmitting member 130 can be spaced ~~configured~~ apart from one another. As ~~In~~ compared ~~comparison~~ with a ~~the~~ transmission ~~case~~ wherein, for example, these members are in contact due to a multi-axial configuration, decreased efficiency of the automatic transmission resulting from friction and so forth from the relative rotation of those units can be avoided ~~prevented~~.

Further, ~~in the event that~~ if the clutch C3 is placed between the ring gear R1 and the sun gear S3, for example, the reduced speed rotation must be engaged and disengaged, and the clutch C3 must be ~~becomes~~ relatively large, but by placing clutch C3 between the input shaft 2 and the sun gear S1, the engaging and disengaging of ~~the rotation of the input shaft 2 from this~~ clutch C3 ~~causes~~ indirectly controls transmission of the reduced speed rotation ~~output~~ from the ring gear R1 of the second planetary gear unit PR ~~to be engaged and disengaged~~, ~~and~~ the clutch C3 can be made more compact, and therefore the automatic transmission can be made more compact.

Further, the automatic transmission ~~device~~ 1_{16} ~~according to the present~~ of this sixteenth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and ~~particularly~~ when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be ~~lowered~~ reduced, and ~~this contributes to the quietness of the~~ the vehicle ~~while~~ can run~~ning~~ more quietly at a high speed.

~~Now, in the event that~~ IS a clutch is ~~configured in~~ located between the planetary gear units PR and ~~the planetary gear unit~~ PU ~~for example~~, the length of the ~~linking member (particularly the~~ transmitting member~~s~~ that links the planetary gear units PR and ~~the planetary gear unit~~ PU must be ~~becomes longer in the~~ axially ~~direction~~ elongated, and since this ~~linking member is for~~ transmitting member

transmits the reduced speed rotation, the thickness of the transmitting member must be increased ~~so as to withstand this,~~ and therefore the weight also increases. Therefore an object of the present invention is to provide an automatic transmission that can shorten the distance between the ~~speed-reduction~~ planetary ~~gear and the planetary~~ gear units and thereby reduce ~~the increase in~~ weight.

~~With~~ In the present embodiment, ~~in particular,~~ the clutch C2 is disposed on the ~~opposite~~ side ~~in the axial direction~~ of the first planetary gear unit PU ~~from~~ opposite the second planetary gear unit PR, and therefore ~~providing~~ a clutch between the planetary gear units PR and ~~the planetary gear unit~~ PU is not necessary, and the length of ~~the linking member, particularly~~ the transmitting member 130 can be ~~made that much~~ shorter. Therefore, ~~an~~ the ~~increase in~~ weight of the automatic transmission as a whole can be ~~prevented~~ reduced.

Seventeenth Embodiment

~~Now, the~~ A seventeenth embodiment, which is a partial modification of the fifteenth embodiment will now be described with reference to Fig. 27 through Fig. 29. ~~Fig. 27 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the seventeenth embodiment, Fig. 28 is an operational table of an automatic transmission relating to the seventeenth embodiment, and Fig. 29 is a speed line diagram of an~~

~~automatic transmission relating to the seventeenth embodiment. Now,~~ Components of the seventeenth embodiment which are the same as those of the fifteenth embodiment ~~will~~ are ~~be~~ denoted by ~~with~~ the same reference numerals, and description thereof omitted, except for the ~~partial~~ modifications.

As Fig. 27 illustrates, the automatic transmission ~~device~~ 1_{17} of the ~~automatic transmission relating to the~~ seventeenth embodiment differs from the fifteenth embodiment ~~is a modification of the~~ with respect to the configuration of the clutch C2, and in use of ~~further, configures~~ a brake B3 instead of a clutch C3, whereby ~~and enables~~ the carrier CR1 of the second planetary gear unit PR can ~~to~~ be fixed by the brake B3. ~~compared to that of the automatic transmission device 1_{16} of the automatic transmission of the fifteenth embodiment (see Fig. 21):~~

Within the automatic transmission ~~device~~ 1_{17}, the brake B3 is located ~~configured~~ on the planetary gear PR, on the side ~~opposite~~ (left side on the diagram) opposite ~~from~~ the planetary gear unit PU. This brake B3 comprises a hydraulic ~~an oil pressure~~ servo 16, ~~a~~ friction plates 76, and a hub unit 133. Further, the clutch C2, comprising a hydraulic ~~an oil pressure~~ servo 12, ~~a~~ friction plates 72, a drum ~~-shaped member~~ 123, and a hub unit 124, is located ~~configured on~~ radially inward of the ~~the inner circumference side of above-mentioned~~ brake B3 ~~,~~ ~~that is to say, is enclosed~~ and within the hub unit 133. The hub unit 133 of ~~this~~ brake B3 is connected to one ~~the~~ side plate ~~of one side~~ of the carrier CR1, and the other side plate of the

intermeshed with friction plates

~~other side of this~~ carrier CR1 is rotatably supported by the input shaft 2 ~~so as to be capable of rotating~~. Further, the sun gear S1 is connected to the input shaft 2 via the drum ~~-shaped member~~ 123 of the clutch C2. ~~Also,~~ The friction plates 74 of the brake B1 ~~is~~ are splined ~~with~~ to the outer circumferen~~ce side~~tial surface of the ring gear R1, and this ring gear R1 is connected ~~to~~ by the transmitting member 130, ~~and is connected~~ to the sun gear S3, ~~via this transmitting member 130.~~

~~Continuing, based on the above-mentioned construction,~~ The operations of ~~an~~ the automatic transmission ~~device~~ 1_{17} will now be described~~,~~ with reference to Fig. 27, Fig. 28, and Fig. 29 below. Now, as with the above-mentioned first embodiment, the vertical ax~~i~~es of the speed line diagram illustrated in Fig. 29 indicate~~s~~ the ~~revolutions~~ speeds of each rota~~tion~~ry component, and the horizontal axis indicates the corresponding gear ratio of these rota~~tion~~ry components. ~~Further, regarding~~ In the planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 29) corresponds to ring gear R3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ax~~i~~es correspond~~s~~ to the ring gear R2 and the carrier CR3, the carrier CR2, and the sun gears S2 and ~~the sun gear~~ S3. Further, ~~regarding~~ in the second planetary gear unit PR section of this speed line diagram, the vertical axis to the

farthest horizontal edge (the right side of Fig. 29) corresponds to sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ax~~i~~es correspond~~s~~ to the ring gear R1 and the carrier CR1. Further, the widths between these vertical axes are inversely proportional to the ~~inverse of the~~ number of teeth of each of the sun gears S1, S2, S3, and to the ~~inverse of the~~ number of teeth of each of the ring gears R1, R3. Again ~~Also~~, the dotted line ~~in the~~ horizontal ~~direction~~ in the diagram represents ~~illustrate that~~ the rotation ~~is~~ transmitted by ~~from~~ the transmitting member 130.

As Fig. 27 illustrates, by engaging ~~retaining~~ the brake B3, the ~~above-mentioned~~ carrier CR1 is fixed ~~as~~ to the case 3. Further, the rotation of the input shaft 2 is input to the sun gear S1, and the ~~above-mentioned~~ ring gear R1 rotates at reduced speed rotation~~s~~ based on the rotation of input shaft 2 which is input to this sun gear S1, with the ~~because this~~ carrier CR1 ~~is~~ fixed. In other words, by engaging the brake B3, the reduced speed rotation of the ring gear R3 is input to the sun gear S3 via the transmitting member 130.

~~By doing so,~~ As Fig. 28 and Fig. 29 illustrate, with regard to ~~regarding~~ the second planetary gear unit PR, in ~~at~~ third speed forward, fifth speed forward, and first speed reverse, the rotation of the input shaft 2 is input to the sun gear S1 by engagement of ~~retaining~~ the brake B3 to fix the carrier CR1 ~~is fixed~~, and the reduced speed rotation is output to the ring gear R3 by the

rotation of the sun gear S1 ~~wherein the~~ which receives input of rotation of the input shaft 2~~, as input~~, and the reduced speed rotation is input to the sun gear S3 via the transmitting member 130. In this case, the ring gears R1 and ~~the ring gear~~ R3 are rotating at the reduced speed, and therefore the ~~above-mentioned~~ transmitting member 130 ~~performs~~ transmits a relatively large torque. ~~transmission.~~ On the other hand, at first speed forward, second speed forward, fourth speed forward, and sixth speed forward, the rotation of the ring gear R3 is input to the ring gear R1 via the transmitting member 130, and further, because the brake B3 is released, as Fig. 29 illustrates, the carrier CR1 rotates ~~based on each the rotation~~ within the speed range ~~level~~ of this ring gear R1 and the sun gear S1. ~~of the rotation of the input shaft 2.~~

~~Now, t~~The operations ~~actions~~ of the second ~~above-mentioned~~ planetary gear unit PR are similar to those of the ~~above-described~~ fifteenth embodiment (see Fig. 22 and Fig. 23), and accordingly description thereof will not be repeated here ~~omitted~~.

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_{17} of this seventeenth embodiment, ~~relating to the present invention,~~ due to the planetary gear PR and the clutch C2 being located ~~configured~~ on one side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C1 being located ~~reconfigured~~ on the ~~other side in the~~ axial ~~direction~~ opposite side of the planetary gear unit PU, the planetary gear PR and the planetary gear

unit PU can be ~~configured~~ located more closely together, as compared to ~~the case~~ a transmission wherein, for example, two clutches C1 and C2 are ~~configured in~~ disposed between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 130 ~~for transmitting reduced rotation~~ can be made relatively shorte~~ned~~r. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia ~~(force of inertia)~~ can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced.

Further, since the ~~oil pressure~~ hydraulic servos 11 and 12 are ~~provided~~ mounted on the input shaft 2, one set of the seal rings 81 and 82 seal the case 3 to the input shaft 2 for ~~and~~ supply of oil to the oil lines 2a and 2b provided within input shaft 2, and therefore oil can be supplied to the oil chambers of ~~oil pressure~~ hydraulic servos 11 and 12 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servos 11 and 12. Therefore, oil can be supplied simply by providing one set of the seal rings 81 and 82 each ~~for~~ of the ~~oil pressure~~ hydraulic servos 11 and 12, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, the clutch C1 ~~is a clutch which~~ engages at the relatively slow to medium speeds ~~levels~~ of first speed forward, second speed forward, third speed forward, and

fourth speed forward, and therefore when this clutch C1 is released at the relatively high speeds ~~levels~~ of fifth speed forward, sixth speed forward, or first speed reverse, ~~particularly~~ the hub unit 122 that connects this clutch C1 and the sun gear S2 rotates at a relatively high speed ~~revolution~~ or ~~revolves~~ in reverse (see Fig. 3). On the other hand, in ~~at~~ ~~the~~ fifth speed forward and ~~or~~ first speed reverse the transmitting member 130 rotates at reduced ~~rotation~~ speed, and in ~~at~~ a sixth speed forward the transmitting member 130 may be fixed in some cases, and accordingly the speeds of ~~difference in revolutions between~~ the hub unit 122 and the transmitting member 130 can differ ~~occur~~. However, because ~~this~~ [illegible] ~~clutch~~ C1 is located on the ~~opposite~~ side of the first opposite second the planetary gear PR ~~via the~~ planetary gear unit PU, the hub unit 122 and the transmitting member 130 can be spaced ~~configured~~ apart from one another. In comparison with a transmission ~~the case~~ wherein, for example, these members are in contact due to a multi-axial configuration, decreased efficiency of the automatic transmission resulting from friction and so forth from the relative rotation of those units can be avoided. ~~prevented~~.

Further, since the reduced speed rotation output to the first planetary gear unit PU from the second planetary gear unit PR is ~~made to be~~ engaged and disengaged by the brake B3, the number of components ~~parts~~ (for example drums ~~shaped members~~ and so forth) can be reduced as compared to an embodiment including ~~the case wherein~~, for example, ~~the~~ clutch C3. ~~is provided~~. Further, the brake B3 can receive ~~configure~~

a~~n~~ oil supply ~~line~~ directly from the case 3, and therefore the configuration of the oil line can be simplified as compared to the case wherein, for example, a clutch C3 is provided.

~~Further,~~ The automatic transmission device 1_{17} ~~according to the present~~ of this seventeenth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fourth speed forward. Therefore, ~~at~~ in fifth speed forward and sixth speed forward, the gear ratio can be ~~specified to~~ a high ratio, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine ~~revolutions~~ speed can be ~~lowered~~ reduced, ~~and this contributes to the quietness of~~ whereby the vehicle ~~while~~ will run~~ning~~ more quietly at a high speed.

~~Now, in the event that~~ If a clutch is ~~configured in~~ located between the planetary gear PR and the planetary gear unit PU for example, the length of the linking member (particularly the transmitting member) that links the planetary gear PR and the planetary gear unit PU becomes longer in the axial direction, and since this linking member is for transmitting the reduced rotation, the thickness of the member must be increased so as to withstand this, and therefore the weight also increases. Therefore an object of the present invention is to provide an automatic transmission that can shorten the distance between the speed reduction planetary gear and the planetary gear unit, and ~~reduce the increase in~~ weight.

~~With the present embodiment, in particular,~~ In this seventeenth embodiment, because the clutch C2 is disposed on the ~~opposite~~ side ~~in the axial direction~~ of the first planetary gear unit PU opposite ~~from~~ the second planetary gear unit PR, ~~and therefore~~, provi~~ding~~sion of a clutch between the second planetary gear unit PR and the first planetary gear unit PU is not necessary, and the length of the ~~linking member, particularly the~~ transmitting member 130 can be ~~made that much~~ shorter. Therefore, an ~~increase in~~ weight of the automatic transmission as a whole can be less ~~prevented~~.

~~(~~Eighteenth Embodiment~~)~~

~~Below, the~~ An eighteenth embodiment, which is a partial modification of the first through the seventeenth embodiments will now be described, with reference to Fig. 30 through Fig. 32. ~~Fig. 30 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the eighteenth embodiment, Fig. 31 is an operational table of an automatic transmission relating to the eighteenth embodiment, and Fig. 32 is a speed line diagram of an automatic transmission relating to the eighteenth embodiment. Now,~~ Components of the eighteenth embodiment which are the same as those of the first embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description ~~thereof~~ will be omitted, except for ~~partial~~ modifications.

As illustrated in Fig. 30, ~~an~~ the automatic transmission

~~device~~ 1_{18} of the eighteenth embodiment comprises a first planetary gear unit PU and a second planetary PR on the input shaft 2. ~~This~~ The first planetary gear unit PU is a multiple type planetary gear unit, which comprises a sun gear S2, a carrier CR2, a ring gear R2, and a sun gear S3, ~~as the~~ a total of four rota~~tion~~ry components. ~~wherein~~ The carrier CR2 ~~has~~ supports a long pinion PL that meshes with ~~a~~ the sun gear S3 and ~~a~~ the ring gear R2, ~~supported by a side plate,~~ and a short pinion PS that meshes with ~~a~~ the sun gear S3, ~~which are~~ with pinions PL and PS meshed one to another. Further, the ~~above-mentioned~~ second planetary gear unit PR is a double pinion planetary gear unit that has a carrier CR1 ~~, wherein a~~ supporting a pinion Pb, which is meshed with a ring gear R1, and a pinion Pa, which is meshed with a sun gear S2, ~~which are~~ with the pinions Pa and Pb meshed one to another.

On the ~~above-mentioned~~ input shaft 2 is ~~configured~~ a multi-disc clutch (second clutch) C2 on the inner circumference side, which comprises ~~an oil pressure~~ a hydraulic servo 12, ~~a~~ friction plates 72, a clutch drum~~-shaped member~~ 223 ~~that forms a clutch drum~~, and a hub unit 224 linked to ~~a~~ the sun gear S2. ~~and~~ A multi-disc brake B2, located on the outer circumference side, ~~which~~ comprises ~~an oil pressure~~ a hydraulic servo 15, and ~~a~~ friction plates 75 that are intermeshed with friction plates ~~that is~~ splined ~~with the above-mentioned~~ to the hub unit 224.

The oil chamber of this ~~oil pressure~~ hydraulic servo 12 is extend~~ed~~s from one ~~edge~~ end of the case 3, and is connected to an oil line 91 of the boss ~~unit~~ 3a which is ~~provided~~ formed as a sleeve on the ~~above-mentioned~~ input shaft 2. ~~in a sleeve form.~~ Also, this oil line 91 ~~is linked~~ connects to an oil pressure control unit not

illustrated. ~~In other words,~~ Because the ~~above-mentioned~~ hydraulic ~~oil pressure~~ servo 12 is mounted ~~configured~~ on the boss ~~unit~~ 3a, an oil line from the oil pressure control unit, not illustrated, is connected to the oil chamber of the hydraulic ~~oil pressure~~ servo 12 ~~is~~ ~~constructed~~ which provide a by one set of seal rings 81 ~~to~~ seal between ~~this~~ boss unit 3a and the clutch drum ~~shaped member~~ 223.

Further, the above-mentioned input shaft 2 is connected to the ~~above-mentioned~~ clutch drum ~~shaped member~~ 223, and ~~on~~ the inner surface ~~circumference side~~ of a ~~the~~ front portion ~~edge~~ of this drum ~~shaped member~~ 223 is splined to ~~configured the~~ friction plates 72 of the clutch C2 which is operated ~~capable of engaging~~ by the ~~oil pressure~~ servo 12. ~~for the clutch C2, splined.~~ Further, ~~this~~ hub unit 224 is connected to the ~~above-mentioned~~ sun gear S2. Further, the brake B2 has friction plates 75 intermeshed with friction plates splined to ~~is disposed by splining on~~ the outer circumferential surface ~~side~~ of the ~~above-mentioned~~ drum ~~shaped member~~ 224, ~~capable of~~ engaged ~~engaging~~ by operation of hydraulic ~~an oil pressure~~ servo 15.

~~On the other hand,~~ At ~~on~~ the other end ~~side~~ (the left of the diagram) of the input shaft 2 is ~~configured~~ a multi-disc clutch (first clutch) C3, which comprises a hydraulic ~~an oil pressure~~ servo 13, ~~a~~ friction plates 73, a clutch drum ~~shaped member~~ 225 ~~that forms a clutch drum~~, and a hub unit 226. ~~A~~ Friction plates 73 are ~~is~~ splined to ~~with~~ the inner surface ~~circumference side~~ of a ~~the~~ front portion ~~edge~~ of the clutch drum ~~shaped member~~ 225 ~~of this clutch C3~~, and are intermeshed with ~~this~~ friction plates ~~73 is~~ splined to ~~with~~ the outer surface ~~circumference side~~ of a ~~the~~ front portion ~~edge~~ of the hub unit 226.

~~and this hub unit 226~~ which is connected to the carrier CR2.

The oil chamber of this ~~oil pressure~~ hydraulic servo 13 is connected ~~to~~ through an oil line 2b which is formed on the ~~above-mentioned~~ input shaft 2, to ~~and this oil line 2b is provided along the edge of the case 3 that is the opposite side of that of the above-mentioned boss unit 3a, and is connected to the~~ oil line 93 of the boss ~~unit~~ 3b which, in turn, is connected ~~is provided on the input shaft 2 in a sleeve form, and this oil line 93 is linked~~ to ~~an~~ the oil pressure control unit. ~~not illustrated.~~ Therefore, ~~regarding the above-mentioned oil pressure servo 13,~~ by providing one set of seal rings 81 to seal between the boss ~~unit~~ 3b ~~of the case 3~~ and the drum ~~shaped member~~ 225, ~~configures~~ an oil line from the oil pressure control device is ~~not illustrated,~~ connected to the oil chamber of the oil pressure servo 13.

Mounted ~~Further,~~ on the boss ~~unit~~ 3b is ~~configured~~ a multi-disc clutch (third clutch) C1, comprising ~~an oil pressure~~ a hydraulic servo 11, ~~a~~ friction plates 71, and a drum ~~shaped member~~ 221. The oil chamber of the ~~above-mentioned oil pressure~~ hydraulic servo 11 is ~~linked~~ connected to the oil line 94 of the ~~above-mentioned~~ boss ~~unit~~ 3b, and ~~this~~ through oil line 94 ~~is linked~~ to ~~an~~ the oil pressure control unit. ~~not illustrated. Therefore, regarding the above-mentioned oil pressure servo 11, an oil line from the oil pressure control unit, not illustrated, to the oil chamber of the oil pressure servo 11, is constructed by one~~

18th Embod
fig. 30

~~set of seal rings 84 that seal between the boss unit 3b of the case 3 and the drum-shaped member 221~~.

~~Further, on the above-mentioned~~ The boss unit 3b ~~in the left of the diagram,~~ rotatably supports the drum~~-shaped member~~ 221 ~~is supported so as to be capable of rotating~~, and a ~~on the~~ front portion ~~edge~~ of the inner surface ~~circumference side~~ of ~~this~~ drum~~-shaped member~~ 221 is splined to the friction plates 71 of the clutch C1 ~~is splined, which can be~~ engaged by the hydraulic ~~oil pressure~~ servo 11. ~~for the clutch C1.~~ Around ~~On~~ the outer circumference ~~side~~ of this clutch C1 is ~~configured~~ a hub unit 222 on which is formed the ~~above-mentioned~~ ring gear R1. ~~by splining, and~~ This hub unit 222 is rotatably supported by the input shaft 2. ~~so as to be capable of rotation. Further, the~~ Carrier CR1 supports ~~comprises~~ a ~~pinion Pa and a pinion Pb, and this~~ pinion Pb ~~is~~ meshed with the ~~above-mentioned~~ ring gear R1 and a ~~this~~ pinion Pa meshed with the sun gear S1 which is connected to the input shaft 2. This carrier CR1 is fixed to the boss ~~unit~~ 3b of the case 3, via a side plate.

Also, the drum~~-shaped member~~ 221, to which the above-mentioned clutch C1 is splined, is rotatably supported by the ~~above-mentioned~~ boss ~~unit~~ 3b ~~so as to rotate~~, and is connected to a transmitting member 230 ~~is connected~~ for transmitting the rotation of the ring gear R1 when the clutch C1 is engaged, to ~~and further, on the other side of this transmitting member 230 is connected~~ the sun gear S3 of the ~~above-mentioned~~ first planetary gear unit

PU.

~~On the other hand, on~~ Around the outer circumference ~~side~~ of the first planetary gear unit PU is ~~configured~~ a multi-disc brake B1 that comprises ~~an oil pressure~~ a hydraulic servo 14, ~~a~~ friction plates 74, and a hub unit 228. ~~To the~~ A side plate of the carrier CR2 of the ~~above-mentioned~~ first planetary gear unit PU is connected to a hub unit 228 ~~that is splined the~~ to which friction plates are splined ~~74~~ of the above-mentioned brake B1. ~~and~~ Further, this hub unit 228 is connected to the inner race of a one-way clutch F1. The short pinion PS of this carrier CR2 meshes with the sun gear S3. Further, the ~~above-mentioned~~ sun gear S2 and ring gear R2 ~~are~~ mesh with the long pinion PL. ~~of this carrier CR2~~, ~~a linking~~ transmitting member 227 ~~is~~ connects ~~to~~ one edge of ~~this~~ ring gear R2 ~~, and this ring gear R3 is linked~~ to the counter gear 5. ~~via this linking member 227.~~

As described above, the second planetary gear unit PR and the clutches (and) C3 are ~~configured~~ located on one side ~~in the axial direction~~ of the first planetary gear unit PU ~~, and also the clutch C1 is configured on one side in the axial direction~~, and the clutch C2 ~~is configured on the other side in the axial direction,~~ and the counter gear 5 ~~is configured in the~~ are located on the axially opposite ~~direction~~ side (right side of the diagram) of the first planetary gear unit PU. ~~of the planetary gear PR.~~ Further, the clutch C3 is ~~disposed on the inner circumferential side~~ arranged radially inward of the clutch C1, and ~~particularly~~ radially inward of the transmitting

member 230, that transmits the output thereof. Further, ~~the~~ brake B2 is ~~configured on~~ located around the outer circumferen~~tial side~~ce of the clutch C2, and the brake B1 is ~~configured on~~ located around the outer circumferen~~tial side~~ce of the first planetary gear unit PU.

~~Continuing, based on the above mentioned construction, the~~ Operations of ~~an~~ the automatic transmission ~~device~~ 1_{18} of the eighteenth embodiment will now be described~~,~~ with reference to Fig. 30, Fig. 31, and Fig. 32 below. ~~Now,~~ The vertical ax~~i~~es of the speed line diagram illustrated in Fig. 32 indicate~~s~~ the ~~revolutions~~ speeds of ~~each~~ the various rota~~tion~~ry components, and the horizontal axis indicates the corresponding gear ratio of these rota~~tion~~ry components. Further, ~~regarding~~ in the first planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 32) corresponds to sun gear S3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ax~~i~~es correspond~~s~~ to the ring gear R2, the carrier CR2, and the sun gear S2. Further, ~~regarding~~ in the second planetary gear unit PR section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 32) corresponds to the sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ax~~i~~es correspond~~s~~ to the ring gear R1 and the carrier CR1. Further, the widths between these vertical axes are inversely proportional to the ~~inverse of the~~ number of teeth of each of the sun gears S1, S2, S3, and to the

~~inverse of~~ the number of teeth of each of the ring gears R1, R3. ~~Also~~ Again, the dotted line ~~in the~~ horizontal ~~direction~~ in the diagram ~~illustrate that~~ represents the rotation ~~is~~ transmitted ~~from~~ by the transmitting member 230.

As illustrated in Fig. 30, the rotation of the input shaft 2 is input to the above-mentioned sun gear ~~S2~~ S2 by engaging the clutch C2, and the ~~rotation of this~~ sun gear S2 can be fixed by ~~retaining~~ engagement of the brake B2. The rotation of the input shaft 2 is input to the ~~above-mentioned~~ carrier CR2, by engaging the clutch C3, and the ~~rotation~~ carrier CR2 can be fixed by ~~retaining~~ engagement of the brake ~~B2~~ B1. Further, rotation in one direction is controlled by the one-way clutch F1.

~~On the other hand, the above-mentioned~~ The sun gear S1 is connected to and receives input from the input shaft 2, ~~and the rotation of this input shaft 2 is input, and further,~~ the carrier CR1 is connected to the case 3 ~~and~~ whereby its rotation is fixed, and therefore the ring gear R1 rotates at a reduced ~~rotations~~ speed. Further, by engaging the clutch C1, the reduced speed rotation~~s~~ of ~~this~~ ring gear R1 ~~are~~ is input to the sun gear S3. Also, the rotation of the ~~above-mentioned~~ ring gear R2 is output ~~to the above-mentioned counter gear 5, and is output~~ to the drive wheels ~~via~~ through this counter gear 5, a counter shaft unit not illustrated, and a differential unit.

~~At~~ In first speed forward within the D (drive) range, as illustrated in Fig. 31, the clutch C1 and the one-way clutch

F1 are engaged. Then, as illustrated in Fig. 32, the reduced speed rotation~~s~~ of the ring gear R1 ~~are~~ is input to the sun gear S3 via the clutch C1 and the transmitting member 230. Further, the rotation of the carrier CR2 is ~~controlled in~~ limited to one direction (the forward rotation direction) by the one-way clutch F1. ~~in other words the carrier CR2 is prevented from rotating in the opposite direction and is fixed.~~ Then, the ring gear R2 rotates ~~forward for the~~ in first speed forward, derived from the reduced speed rotation~~s~~ input to the sun gear S2 and the fixed state of carrier CR2, and ~~that rotation~~ this first speed forward rotation at is output from the counter gear 5.

~~Now, when~~ For downshifting (when coasting), the brake B1 is ~~retained and~~ engaged to fix the carrier CR2 ~~is fixed~~, and the above-~~mentioned~~ described state of first speed forward is maintained while preventing ~~the~~ forward rotation of ~~this~~ carrier CR2. Further, ~~at this~~ in first speed forward, the one-way clutch F1 prevents the carrier CR2 from reverse rotation ~~in the opposite direction and allows forward rotation~~, and therefore, switching from a non-driving range to a driving range and ~~achieving the~~ establishing first speed forward can be accomplished more smoothly by the automatic engag~~ing~~ement of the one-way clutch. In this ~~case~~ first speed forward, because the sun gear S3 and the ring gear R1 are rotating at a reduced ~~rotation~~ speed, the ~~above mentioned~~ transmitting member 230 ~~performs~~ transmits a relatively large torque~~ transmission~~.

~~At~~ In second speed forward within the D (drive) range, as

illustrated in Fig. 31, the clutch C1 ~~is engaged~~ and the brake B2 are engaged ~~is retained~~. Then, as illustrated in Fig. 32, the reduced speed rotation~~s~~ of the ring gear R1 is ~~are~~ input to the sun gear S3 via the clutch C1 and the transmitting member 230, and the rotation of the sun gear S2 is fixed by the brake B2. By doing so, the carrier CR2 rotates at a slightly reduced speed ~~rotations slightly~~, and driven by ~~from~~ the reduced speed rotation~~s~~ input to the sun gear S3 and the ~~this~~ slightly reduced speed rotation of the carrier CR2, the ring gear R2 rotates at ~~forward for the~~ second speed forward, which ~~and this~~ rotation is output to the counter gear 5. ~~Now,~~ Also in this case, because the sun gear S3 and the ring gear R1 are rotating at a reduced speed ~~rotation~~, the ~~above-mentioned~~ transmitting member 230 transmits ~~performs~~ a relatively large torque. ~~transmission~~.

In ~~At~~ third speed forward within the D (drive) range, as illustrated in Fig. 31, the clutch C1 and the clutch C2 are engaged. Then, as illustrated in Fig. 32, the reduced speed rotation~~s~~ of the ring gear R1 is input to the sun gear S3 via the clutch C1 and the transmitting member 230, and also the rotation of the input shaft 2 is input to the sun gear S2 by engaging the clutch C2. Further, with ~~by~~ the rotation of the input shaft 2 input to the sun gear S2 and ~~by~~ the reduced speed rotation of the sun gear S3, the ~~fixed~~ carrier CR2 has slightly slower speed ~~greater reduced rotations~~ than the ~~reduced rotations of this~~ sun gear S3. Further, from the input

rotation of the sun gear S2 and the reduced speed rotation~~s~~ of the sun gear S3, the ring gear R2 is rotate~~s~~ at ~~forward for~~ third speed forward, and this rotation is output from the counter gear 5. In this case also, because the sun gear S3 and the ring gear R1 are rotating at a reduced ~~rotation~~ speed, the ~~above-mentioned~~ transmitting member 230 ~~performs~~ Transmits a relatively large torque, ~~transmission.~~

~~At~~ In fourth speed forward within ~~the~~ D (drive) range, as illustrated in Fig. 31, the clutch C1 and the clutch C3 are engaged. Then, as illustrated in Fig. 32, the reduced speed rotation~~s~~ of the ring gear R2 is input to the sun gear S3 via the clutch C1 and the transmitting member 230, and also the rotation of the input shaft 2 is input to the carrier CR2 via the clutch C3. Then, driven by the rotation of input shaft 2 input to the carrier CR2 and by the reduced speed rotation~~s~~ of the sun~~s~~ gear S3, the ring gear R2 rotates at ~~forward for~~ fourth speed forward, and this rotation is output from the counter gear 5. In this case also, because the sun gear S3 and the ring gear R1 are rotating at a reduced ~~rotation~~ speed, the ~~above-mentioned~~ transmitting member 230 ~~performs~~ Transmits a relatively large torque, ~~transmission~~.

~~At~~ In fifth speed forward within the D (drive) range, as illustrated in Fig. 31, the clutch C2 and the clutch C3 are engaged. Then, as illustrated in Fig. 32, the rotation of input shaft 2 is input to the carrier CR2 via the clutch C3,

and also the rotation of the input shaft 2 is input to the sun gear S2 via the clutch C2. Then, ~~from~~ with the rotation of the input shaft 2 input to the sun gear S2, and ~~the rotation of the input shaft 2 input~~ to the carrier CR2, the ring gear R2 is in a direct-connect rotating state, and rotates ~~forward for the~~ at fifth speed forward, ~~which has~~ i.e., at the same ~~rotation~~ speed as the input shaft 2, and this rotation is output from the counter gear 5.

~~At~~ In sixth speed forward within the D (drive) range, as illustrated in Fig. 31, the clutch C3 ~~is engaged~~ and the brake B2 ~~is retained~~ are engaged. Then, as illustrated in Fig. 32, the rotation of the input shaft 2 is input to the carrier CR2 via the clutch C3, and ~~rotation of~~ the sun gear S2 is fixed by ~~retaining~~ engagement of the brake B2. Then, ~~from~~ with the rotation of the input shaft 2 input to the carrier CR2 and ~~from~~ the ~~fixed~~ sun gear S2 fixed, the ring gear R2 rotates at ~~overdrive rotations for~~ sixth speed forward, and this rotation is output from the counter gear 5.

~~At~~ In first speed reverse within the R (reverse) range, as illustrated in Fig. 31, the clutch C2 ~~is engaged~~ and the brake B1 ~~is retained~~ are engaged. Then, as illustrated in Fig. 32, the rotation of the input shaft 2 is input to the sun gear S2 by engaging the clutch C2, and ~~also the rotation of~~ the carrier CR2 is fixed by ~~retaining~~ engagement of the brake B1. Then, ~~from~~ with the rotation of the input shaft 2 input to the sun gear S2 and

~~from~~ the fixed carrier CR2, the ring gear R2 rotates at ~~in the opposite direction as the~~ first speed reverse, and this rotation is output to the counter gear 5.

In ~~At the~~ P (parking) range and ~~the~~ N (neutral) range, the ~~particularly~~ clutches C1, ~~clutch~~ C2, and ~~clutch~~ C3 are released, the ~~transmission movement between the~~ input shaft 2 from ~~and~~ the counter gear 5 is disconnected, and the automatic transmission ~~device~~ 1_{18} as a whole is in an idle state (neutral state).

As described above, in ~~according to~~ the automatic transmission ~~device~~ 1_{18} of the eighteenth embodiment ~~relating to the present invention~~, because the second planetary gear unit PR and the clutch C3 ~~is~~ are located ~~configured~~ on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 is located ~~configured~~ on the opposite side ~~other side in the~~ axially ~~direction~~ of the first planetary gear unit PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be located more ~~configured~~ closely together, as compared, for example, to ~~the~~ an embodiment ~~case~~ wherein ~~for example~~ two clutches C2 and C3 are located ~~configured in~~ between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 230 ~~for transmitting reduced rotation~~ can be relatively shorter ~~shortened~~. In this manner ~~By doing so~~, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the

occurrence of speed change shock can be reduced. Further, compared to an embodiment ~~the case~~ wherein three clutches C1, C2, C3 are located ~~configured~~ on one side of the first planetary gear unit PU, the oil lines (for example, 2b, 91, 93, 94) that supply the hydraulic ~~oil pressure~~ servos 11, 12, and 13 of these clutches C1, C2, C3 can be more constructed easily, ~~and~~ the manufacturing process can be simplified and the costs can be reduced ~~brought down~~.

Further, since the hydraulic ~~oil pressure~~ servo 13 is provided on the input shaft 2, one set of seal rings 82 form a seal between the case 3 and input shaft 2 to ~~and~~ supply oil through ~~to~~ the oil line 2b provided within input shaft 2~~, and therefore oil can be supplied~~ to the oil chamber of hydraulic ~~oil pressure~~ servo 13, without providing seal rings between, for example, the input shaft 2 and the oil pressure servo 13. Further, hydraulic ~~oil pressure~~ servos 11 and 12 can receive supply of oil directly from the bosses ~~units~~ 3a, 3b ~~provided from the case 3~~, without passing through other components. ~~units for example, in other words, can supply oil by providing one set of seal rings 81 and 84~~. Therefore, oil can be supplied simply by providing one set of seal rings 81, 82, and 84 each for of the hydraulic ~~oil pressure~~ servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, since the clutch C3 is radially inward ~~configured on the inner circumference side~~ of the clutch C1, the clutch C1, which must transmit a relatively large torque ST ~~in order to transmit~~

the reduced ~~rotation~~ speed, can be ~~configured~~ located on the outer circumference side, and this clutch C1 and the ~~oil pressure~~ hydraulic servo 11 thereof can have an increased diameter. Particularly, the pressure receiving area of the oil chamber of the oil pressure servo 11 can be enlarged, and the ~~capacity capable of~~ torque transmission capacity of this clutch C1 can thereby be increased. By ~~configuring~~ designing the clutch C3 ~~which can~~ to have a smaller capacity ~~for~~ torque transmission as compared to the clutch C1, the automatic transmission can be made more compact.

Further, because clutch C2 ~~is a clutch that~~ engages ~~while at~~ in first speed reverse, ~~when this clutch 2 is engaged at first speed reverse~~, the hub unit 224 that connects this clutch C2 and the sun gear S2 rotate~~s~~ at the same ~~rotation~~ speed as the input shaft 2, ~~by engaging this clutch C2,~~ while the transmitting member 230 rotates in the opposite direction, and accordingly ~~there may be cases whereby the rotation~~ there is a great difference between the rotational speed ~~of~~ of the transmitting member 230 and that of the hub unit 224 ~~becomes great~~, but due to ~~this~~ clutch C2 being located on the ~~opposite~~ side of the first planetary gear ~~PR, via~~ PU opposite the second planetary gear unit ~~PU~~ PR, the transmitting member 230 and the hub ~~hunt~~ 224 can be ~~configured~~ spaced apart from one another. Compared to the case wherein, for example, those parts come into contact due to a multiple axis construction, the decreased efficiency of the automatic transmission caused by the friction produced by the relative rotation between those

parts can be ~~prevented~~ avoided.

Further, the automatic transmission ~~device~~ 1_{18} according to ~~the present~~ this eighteenth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fifth speed forward. Therefore, at first speed forward and fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ more precisely set, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine speed can be ~~utilized with better revolutions, and this contributes to increased~~ reduced and fuel economy of the vehicle while running at a low to medium speed can be improved.

~~Now, the linking member (in particular~~ the transmitting member~~)~~ for linking the planetary gear units PR and ~~the planetary gear unit~~ PU requires rigidity to withstand the reduced speed torque that ~~is input~~ it transmits. For example, in the case of ~~configuring~~ a clutch that engages at a slow to medium speed ~~or~~ and a clutch that engages and disengages reduced speed rotations located on the inner circumference side of the linking member, the clutch~~es~~ must have a large capacity, and therefore ~~an~~ appropriately diameter ~~to~~ corresponding ~~with~~ to this capacity becomes necessary. Therefore, in the event that the ~~linking~~ transmitting member is the type that passes on the radially outer ~~circumference~~ side of this ~~type of~~ clutch, an even ~~a~~ larger diameter than the ~~necessary diameter measurement of those clutches~~ becomes necessary, ~~and~~ the diameter ~~measurement~~ of the ~~linking~~ transmitting

member must be further ~~is~~ enlarged ~~more than necessary~~, and the automatic transmission as a whole must have a ~~becomes~~ greater ~~in the direction of the~~ diameter. Therefore an object of the present embodiment is to minimize ~~reduce the enlargement of~~ the diameter ~~measurement~~, and to thereby provide a compact automatic transmission.

According to the present embodiment, all clutches can be designed to avoid ~~configured without~~ enlarging the diameter ~~measurement~~ of the transmitting (linking) ~~linking~~ member, by providing ~~configuring~~ a clutch C3 with a small capacity ~~on the linking member, particularly~~ on the radially inner ~~circumference~~ side of the transmitting member 230.

Nineteenth Embodiment

~~Now, the~~ A nineteenth embodiment, which is a partial modification of the eighteenth embodiment will now be described, with reference to Fig. 33 through Fig. 36. ~~Fig. 33 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the nineteenth embodiment, Fig. 34 is an operational table of an automatic transmission relating to the nineteenth embodiment, and Fig. 35 is a speed line diagram of an automatic transmission relating to the nineteenth embodiment.~~

~~Now,~~ Components of the nineteenth embodiment which are the same as those of the eighteenth embodiment are ~~will be~~ denoted by ~~with~~ the same reference numerals, and description thereof will not be repeated ~~omitted~~, except for the ~~partial~~ modifications.

As Fig. 33 illustrates, the automatic transmission

~~device,~~ 1_{19} of the automatic transmission ~~relating to~~ of the nineteenth embodiment ~~is a modification of~~ has modified the configuration of the clutch C2, and further, ~~changes~~ and the construction of the oil line ~~of~~ for the ~~oil pressure~~ hydraulic servo 12 ~~of the clutch C2,~~ is changed, as compared to ~~that of~~ the automatic transmission ~~device~~ 1_{18} of ~~the automatic transmission of~~ the eighteenth embodiment (see Fig. 30).

Within the automatic transmission ~~device~~ 1_{19}, the clutch C1 is ~~configured~~ located on the side of the second planetary gear unit PR, ~~on the~~ opposite (left side on the diagram) ~~from~~ the first planetary gear unit PU. ~~The~~ A front ~~edge~~ portion of the inner circumferen~~ce side~~tial surface of the drum ~~shaped member~~ 221 of this clutch C1 is splined ~~with~~ to the friction plates 71 which are intermeshed with friction plates ~~and the inner circumference side of this friction plate 71 is~~ splined ~~with~~ to the hub unit 222. The drum~~-shaped member~~ 221 is connected to the input shaft 2, and the hub unit 222 is connected to the sun gear S1 of the second planetary gear unit PR. The side plate of the carrier CR1 of this second planetary gear unit PR is fixed to and supported by the case 3. ~~Also,~~ The ring gear R1 is connected ~~to~~ through the transmitting member 230 ~~and this transmitting member is connected~~ to the sun gear S3. Further, the clutch C3, comprising ~~an oil servo~~ a hydraulic 13, ~~a~~ friction plates 73, a drum~~-shaped member~~ 225, and a hub unit 226, is ~~configured~~ located so as to be enclosed within this transmitting member 230.

The oil chamber of ~~this oil pressure~~ hydraulic servo 12 is ~~linked~~ connected

to an oil line 2a which is formed on the input shaft 2, and this oil line 2a ~~is provided along one edge of the case, and~~ is connected to the oil line 91 of the boss unit 3a which forms a sleeve ~~is~~ around one end of ~~provided on~~ the input shaft 2 ~~in a sleeve form~~, and this oil line 91 is linked to an oil pressure control unit not illustrated. Therefore, ~~regarding the above-mentioned oil pressure servo 12,~~ simply by providing one set of seal rings 81 ~~to seal~~ between the input shaft 2 and the boss ~~unit~~ 3a ~~of the case 3~~, ~~an~~ oil communication is established between ~~line is constructed from~~ the oil pressure control device ~~(not illustrated, to~~ and the oil chamber of the hydraulic ~~oil pressure~~ servo 12.

~~Continuing, based on the above-mentioned construction,~~ The operations of the automatic transmission ~~device~~ 1_{19} of the nineteenth embodiment will now be described~~,~~ with reference to Fig. 33, Fig. 34, and Fig. 35 below. ~~Now,~~ As with the previously described ~~above-mentioned first~~ embodiments, the vertical axes of the speed line diagram illustrated in Fig. 35 indicate the speeds ~~revolutions~~ of the various ~~each~~ rotary ~~rotation~~ components, and the horizontal axis indicates the corresponding gear ratio of these rotary ~~rotation~~ components. ~~Further, regarding~~ In the first planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 35) corresponds to sun gear S3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical axes correspond to the ring gear R2, the carrier CR2, and the sun gear S2. Further, in ~~regarding~~ the second planetary

gear unit PR section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 35) corresponds to sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical axes correspond to the ring gear R1 and the carrier CR1. Further, the widths between these vertical axes are proportional ~~to the~~ inverse 1/ ~~of~~ the number of teeth of each of the sun gears S1, S2, S3, and to the ~~inverse of the~~ number of teeth of each of the ring gears R1, R3. Also, the dotted line ~~in the~~ horizontal ~~direction~~ in the diagram ~~illustrate that~~ represents the rotation ~~is~~ transmitted ~~from~~ by the transmitting member 230.

As illustrated in Fig. 33, by engaging the clutch C1, the rotation of the input shaft 2 is input to the sun gear S1. Further, the ~~rotation of the above-mentioned~~ carrier CR1 is fixed ~~as~~ to the case 3, and the ~~above-mentioned~~ ring gear R1 rotates at a reduced ~~rotations~~ speed based on the rotation of the input shaft 2 input ~~to this~~ into sun gear S1. In other words, by engaging the clutch C1, the reduced speed rotation of the ring gear R1 is input to the sun gear S2 via the transmitting member 230.

~~Then, a~~As illustrated in Fig. 34 and Fig. 35, within the second planetary gear unit PR, ~~at~~ in first speed forward, second speed forward, third speed forward, and fourth speed forward, the rotation of the input shaft 2 is input to the sun gear S1 by

engag~~ing~~ement of the clutch C1, the reduced speed rotation is output to the ring gear R3 ~~from~~ through the fixed carrier CR1, and the reduced speed rotation is input to the sun gear S3 via the transmitting member 230. At this time, the ring gear R1 and the sun gear S3 rotate at a reduced speed, and therefore the ~~above-mentioned~~ transmitting member 230 ~~performs~~ transmits a relatively large torque ~~transmission~~. On the other hand, ~~at~~ in fifth speed forward, sixth speed forward, and first speed reverse, the rotation of the sun gear S3 is input to the ring gear R1 via the transmitting member 230, and further, because the clutch C1 is released, as illustrated in Fig. 35, the sun gear S1 rotates based on ~~each different~~ the speed of ~~this~~ ring gear R1 and the fix~~ed~~ation of the carrier CR1.

~~Now,~~ The other operations ~~actions~~ of the nineteenth embodiment ~~above-mentioned planetary gear~~ are similar to those of the ~~above-described~~ eighteenth embodiment (see Fig. 31 and Fig. 32), and accordingly description thereof will be omitted.

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_{19} ~~relating to the present invention~~ of the nineteenth embodiment, due to the second planetary gear unit PR and the clutch C3 being ~~configured~~ located on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 being ~~configured~~ on ~~the other side in~~ the axially ~~direction~~ opposite side of the first planetary gear unit PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be ~~configured~~ located more closely together, as compared to

an embodiment th~~e case~~ wherein, for example, two clutches C2 and C3 are located ~~configured in~~ between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 230 ~~for transmitting reduced rotation~~ can be made relatively shorte~~ned~~r. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case, wherein three clutches C1, C2, C3 are located ~~configured~~ on one side of the first planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 93, 94) that supply the hydraulic ~~oil pressure~~ servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed more easily, ~~and~~ the manufacturing process can be simplified and the costs can be reduced ~~brought down~~.

Further, since the hydraulic ~~oil pressure~~ servos 12, 13 are provided on the input shaft 2, one set of seal rings 81 and 82 form a seal with the case 3 for ~~and~~ supply oil through ~~to~~ the oil lines 2a and 2b ~~provided~~ within input shaft 2, ~~and therefore oil can be supplied~~ to the oil chambers of oil pressure servos 12, 13, without providing the paired seal rings between, for example, the input shaft 2 and the hydraulic ~~oil pressure~~ servos 12, 13. Further, the hydraulic ~~oil pressure~~ servo 11 can receive supply of oil directly from the boss ~~unit~~ 3b ~~extended from the case 3~~, without passing through other components ~~parts for example~~, and therefore the ~~can~~ supply oil can be connected by providing

one set of seal rings 84. Therefore, oil can be supplied ~~simply by providing one~~ through sets of seal rings 81 and 82, 84 ~~each~~ for the oil pressure servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, since the clutch C2 ~~is a clutch that~~ engages ~~while at~~ for first speed reverse, when this clutch 2 is engaged ~~at~~ in first speed reverse, the hub unit 224 that connects this clutch C2 and the sun gear S2 rotates at the same ~~rotation~~ speed as the input shaft 2, ~~by engaging this clutch S2,~~ while the transmitting member 230 rotates in the opposite direction, and there ~~may be cases wherein the rotation~~ fore speed difference ~~of~~ between the transmitting member 230 and the hub unit 224 ~~becomes~~ is ~~great, but~~ large, However, since ~~this~~ clutch C2 is located on the ~~opposite~~ side of the first planetary gear unit PU opposite ~~PR, via~~ the second planetary gear unit ~~PU~~ PR, the transmitting member 230 and the hub ~~hunt~~ 224 can be ~~configured~~ spaced apart from one another. Compared to the case wherein, for example, those parts come in contact ~~due to~~ in a multiple axis construction, the ~~decreased~~ loss of efficiency of the automatic transmission caused by the friction produced by the relative rotation between those parts can be ~~prevented~~ avoided.

~~Further, in the event that~~ If the clutch C1 were to be ~~is~~ placed between the ring gear R1 and the sun gear S3, for example, the reduced speed rotation must be engaged and disengaged, and ~~a~~ a larger clutch

C1 would be required. However, the clutch C1
~~becomes relatively large, but~~ by placing between the input shaft 2 and the sun gear S1, the engaging and disengaging of the rotation of the input shaft 2 ~~from~~ by this clutch C1 ~~causes~~ indirectly the reduced speed rotation output from the ring gear R1 of the second planetary gear unit PR to be engaged and disengaged, ~~and~~ the clutch C1 can be made more compact, and therefore the automatic transmission can be made more compact.

Further, because the automatic transmission ~~device~~ 1_{19} according to the nineteenth ~~present~~ embodiment is ~~a transmission device that is~~ directly coupled in ~~at~~ fifth speed forward, in ~~Therefore, at~~ first speed forward and fourth speed forward, the gear ratio can be more precisely set for optimum efficiency ~~specified in a detailed manner~~, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be operated more efficiently ~~utilized with better revolutions, and this contributes to increased~~ and fuel economy of the vehicle while running at a low to medium speed can also be increased.

~~Now, the linking member (in particular~~ The transmitting members which ~~for~~ links ~~ing~~ the planetary gear units PR and ~~the planetary gear unit~~ PU requires rigidity to withstand the reduced speed torque that is input. ~~For example,~~ In the case of ~~configuring~~ a clutch that engages at a slow to medium speed and in the case of ~~or~~ a clutch that engages and disengages at reduced speed and is located ~~rotations on~~ radially inward ~~the inner circumference side~~ of the transmitting ~~linking~~ member, the clutches must have a large capacity and therefore a large

~~appropriate~~ diameter to provide the required ~~correspond with this~~ capacity. ~~becomes necessary.~~ Therefore, in the event that the transmitting ~~linking~~ member ~~is the type that~~ passes on the radially outer ~~circumference~~ side of such a ~~this type of~~ clutch, ~~even a larger diameter than~~ the necessary diameter ~~measurement of those~~ for the clutch~~es~~ becomes even larger necessary, ~~and~~ the diameter ~~measurement~~ of the ~~linking~~ transmitting member is enlarged more than necessary, and the automatic transmission as a whole has a ~~becomes~~ greater ~~in the direction of the~~ diameter. Therefore an object of the present embodiment is to avoid the need for ~~reduce the~~ enlargement of the diameter ~~measurement~~, and to provide a more compact automatic transmission.

In this nineteenth ~~According to the present~~ embodiment, all clutches can be configured so as to avoid ~~without~~ enlarg~~ing~~ement of the diameter ~~measurement~~ of the tr ~~linking~~ member, because ~~by configuring a~~ clutch C3 with a small capacity ~~on the linking member, particularly on the inner~~ is provided radially inward ~~circumference side~~ of the transmitting member 230.

Twentieth Embodiment

~~Below,~~ The twentieth embodiment, which is a partial modification of the eighteenth embodiment will now be described, with reference to Fig. 36 through Fig. 38. ~~Fig. 36 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the twentieth embodiment, Fig. 37 is an operational table of an automatic transmission relating to the twentieth embodiment, and Fig. 38 is a speed line diagram of an~~

~~automatic transmission relating to the twentieth embodiment~~.

~~Now,~~ Components of the twentieth embodiment which are the same as those of the eighteenth embodiment are ~~will be~~ denoted by ~~with~~ the same reference numerals, and description thereof omitted, except for the ~~partial~~ modifi~~cations~~ed features.

As Fig. 36 illustrates, the automatic transmission ~~device~~ 1_{20} of the ~~automatic transmission relating to the~~ twentieth embodiment comprises a brake B3 instead of a clutch C1, and enables the carrier CR1 of the planetary gear PR to be fixed by the brake B3, and further differs from the eighteenth embodiment in the ~~, changes the~~ construction of the oil line for ~~of~~ the hydraulic ~~oil pressure~~ servo 12 of the second planetary gear unit PR. ~~compared to that of the automatic transmission device 1_{18} of the automatic transmission of the eighteenth embodiment (see Fig. 30).~~

Within this automatic transmission ~~device~~ 1_{20}, the brake B3 is located ~~configured~~ on the side of the second planetary gear unit PR ~~, on the~~ opposite (left side on the diagram) ~~from~~ the first planetary gear unit PU. This brake B3 comprises a hydraulic ~~an oil pressure~~ servo 16, ~~a~~ friction plates 76, and a hub unit 233.

The hub unit 233 of ~~this~~ brake B3 is connected to the side plate on ~~of~~ one side of the carrier CR1, and this carrier CR1 is rotatably supported by the input shaft 2 or the boss unit 3a. ~~so as to be capable of rotating. Further,~~ The sun gear S1 is connected to the input shaft 2. ~~Also, this~~ Ring gear R1 is connected to the ~~transmitting member 230, and is connected~~

~~to the~~ sun gear S3 via ~~this~~ transmitting member 230.

The oil chamber of the hydraulic ~~this oil pressure~~ servo 12 is connected ~~linked~~ to an oil line 2a which is formed on the input shaft 2, ~~and~~ This oil line 2a, in turn, ~~is provided along one edge of the case, and~~ is connected to the oil line 91 which is connected ~~of the boss unit 3a which is provided on the input shaft 2 in a sleeve form, and this oil line 91 is linked~~ to an oil pressure control unit not illustrated. Therefore, for hydraulic ~~regarding the above-mentioned oil pressure~~ servo 11, simply by providing one set of seal rings ~~81 to seal~~ between the input shaft 2 and the boss unit 3a of the case 3, the ~~an~~ oil supply ~~line~~ is connected ~~constructed~~ from the oil pressure control device ~~not illustrated~~ to the oil chamber of the hydraulic ~~oil pressure~~ servo 12.

~~Continuing, based on the above-mentioned construction,~~ ~~the~~ Operations of the ~~an~~ automatic transmission of the twentieth embodiment ~~device~~ 1_{20} will now be described~~,~~ with reference to Fig. 36, Fig. 37, and Fig. 38. ~~below.~~ Now, as with the previously described ~~above-mentioned first~~ embodiments, the vertical axes of the speed line diagram illustrated in Fig. 38 indicate the respective speeds ~~revolutions~~ of the various rotary ~~each rotation~~ components, and the horizontal axis represents ~~indicates~~ the corresponding gear ratios of these rotary ~~rotation~~ components. In ~~Further, regarding~~ the first planetary gear unit PU section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 38) corresponds to sun gear S3, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the

vertical ax~~i~~es correspond~~s~~ to the ring gear R2, the carrier CR2, and the sun gear S2. Further, in ~~regarding~~ the second planetary gear unit PR section of this speed line diagram, the vertical axis to the farthest horizontal edge (the right side of Fig. 38) corresponds to sun gear S1, and ~~hereafter~~ moving to the left ~~direction~~ within the diagram, the vertical ax~~i~~es correspond~~s~~ to the ring gear R1 and the carrier CR1. Further, the widths between these vertical axes are inversely proportional to ~~the inverse of~~ the number of teeth of each of the sun gears S1, S2, S3, and to the ~~inverse of the~~ number of teeth of each of the ring gears R1, R3. Also, the dotted line ~~in~~ the horizontal ~~direction~~ in the diagram represents ~~illustrate that~~ the rotation ~~is~~ transmitted from the transmitting member 230.

As Fig. 36 illustrates, by engaging ~~retaining~~ the brake B3, the ~~above-mentioned~~ carrier CR1 is fixed ~~as~~ to the case 3. Further, the rotation of the input shaft 2 is input to the sun gear S1, and the ~~above-mentioned~~ ring gear R1 rotates at a reduced speed ~~rotations based on the rotation of input shaft 2 which is input to this sun gear S1,~~ because this carrier CR1 is fixed. In other words, by engaging the brake B3, the reduced speed rotation of the ring gear R1 is input to the sun gear S3 via the transmitting member 230.

In this manner ~~By doing so~~, as Fig. 37 and Fig. 38 illustrate, in ~~regarding~~ the second planetary gear unit PR, in ~~at~~ first speed forward,

second speed forward, third speed forward, and fourth speed forward, the rotation of the input shaft 2 is input to the sun gear S1 by ~~retaining~~ engaging the brake B3, the carrier CR1 is fixed, ~~and~~ the reduced speed rotation is output to the ring gear R3 by the rotation of the sun gear S1 ~~wherein the rotation of the input shaft 2 is input~~, and the reduced speed rotation is input to the sun gear S3 via the transmitting member 230. In this case, the ring gear R1 and the sun gear S3 are rotating at reduced speed, and therefore the ~~above-mentioned~~ transmitting member 230 transmits ~~performs~~ a relatively large torque. ~~transmission.~~ On the other hand, in ~~at~~ fifth speed forward, forward speed level, and first speed reverse, the rotation of the sun gear S3 is input to the ring gear R1 via the transmitting member 230, and further, because the brake B3 is released, as Fig. 38 illustrates, the carrier CR1 rotates ~~based on each the rotation~~ with~~in~~ the speed ~~level~~ of ~~this~~ ring gear R1 and the sun gear S1. ~~of the rotation of the input shaft 2.~~

~~Now,~~ The operations ~~other than these~~ of the second ~~above-mentioned~~ planetary gear unit are similar to those of the ~~above-described~~ eighteenth embodiment, and accordingly description thereof will be omitted.

As described above, in ~~according to~~ the automatic transmission ~~device~~ 1_{20} of the twentieth embodiment, ~~relating to the present invention~~, due to the second planetary gear unit PR and the clutch C3 being

located ~~configured~~ on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 being located ~~configured~~ on the ~~other side in the~~ axially opposite side ~~direction~~ of the first planetary gear unit PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be located more ~~configured~~ closely together, as compared to an ~~the~~ embodiment ~~case~~ wherein for example two clutches C2 and C3 are located ~~configured in~~ between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 230 for transmitting reduced speed rotation can be made relatively shorter ~~shortened~~. In this manner ~~By doing so~~, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced.

Further, since the hydraulic ~~oil pressure~~ servos 11 and 12 are mounted ~~provided~~ on the input shaft 2, one set of seal rings 81 and 82 serves to ~~seal the case 3 and~~ supply oil from ~~to~~ the oil lines 2a and 2b provided within input shaft 2~~, and therefore oil can be supplied~~ to the oil chambers of hydraulic ~~oil pressure~~ servos 12, 13 without providing seal rings between, for example, the input shaft 2 and the hydraulic ~~oil pressure~~ servos 12, 13. Therefore, oil can be supplied simply by providing one set of seal rings 81 and 82 for each of the hydraulic ~~oil pressure~~ servos 12, 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can

be improved.

Further, ~~since~~ when the clutch C2 ~~is a clutch that engages while at first speed reverse, when this clutch 2~~ is engaged ~~at~~ in first speed reverse, the hub unit 224 that connects this clutch C2 and the sun gear S2 rotates at the same ~~rotation~~ speed as the input shaft 2. Accordingly, by engaging ~~this~~ clutch C2, while the transmitting member 230 is rotat~~es~~ing in the opposite direction, ~~and there may be cases wherein~~ will cause the ~~rotation difference~~ speeds of the transmitting member 230 and the hub unit 224 to become~~s~~ greatly different, but because ~~this~~ clutch C2 is located on the ~~opposite~~ side of the first planetary gear unit PU opposite ~~PR, via~~ the second planetary gear unit ~~PU~~ PR, the transmitting member 230 and the hub ~~hunt~~ unit 224 can be ~~configured~~ spaced apart from one another. Compared to the case wherein, for example, those ~~parts~~ components come into contact ~~due to~~ in a multiple axis construction, the decrease~~d~~ in efficiency of the automatic transmission caused by the friction produced by the relative rotation between those ~~parts~~ components can be ~~prevented~~ avoided.

Further, since the output of the reduced speed rotation ~~output~~ to the first planetary gear unit PU from the second planetary gear unit PR is ~~made to be engaged and disengaged~~ controlled by engagement of the brake B3, the number of ~~parts~~ components (for example drum-shaped members and so forth) can be reduced as compared to ~~the case~~ an embodiment wherein, for example, a clutch C1 is ~~provided~~ employed. Further, the brake B3 can ~~configure an~~ receive a supply of oil ~~line~~ directly from the case 3, and therefore the configuration of the oil line can be simplified as compared

to the case wherein, for example, a clutch C1 is ~~provided~~ employed.

Further, the automatic transmission ~~device~~ 1_{20} according to the ~~present~~ twentieth embodiment is ~~a transmission device that is~~ directly coupled at fifth speed forward. Therefore, ~~at~~ in first speed forward and fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ such as to provide greater efficiency, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be ~~utilized with better revolutions~~ operated more efficiently, and ~~this contributes to increased~~ fuel economy of the vehicle while running at a low to medium speed is increased.

~~Now, the linking member (in particular~~ In this embodiment also, the transmitting ~~member) for~~ units which link~~ing~~s the planetary gear PR ~~and the planetary gear unit~~ PU requires rigidity to withstand the reduced speed torque that is input. For example, in the case of ~~configuring~~ a clutch that engages at a slow to medium speed ~~or~~ and a clutch that engages ~~and disengages~~ to transmit reduced speed rotation~~s~~ and that is located on the inner ~~circumference~~ side of the ~~linking~~ transmitting member, the clutch~~es~~ must have a large capacity and, therefore, ~~an appropriate~~ a large diameter to ~~correspond with this~~ provide the necessary capacity. ~~becomes necessary~~. Therefore, in the event that the ~~linking~~ transmitting member ~~is the type that~~ passes on the radially outer ~~circumference~~ side of ~~this type of~~ such a clutch, even a larger diameter ~~than the necessary diameter measurement~~ of th~~ose~~e clutch~~es~~ becomes necessary, ~~and~~ the diameter ~~measurement~~ of the ~~linking~~ transmitting

member is enlarged more than necessary, and the automatic transmission as a whole ~~becomes~~ has a greater ~~in the direction of the~~ diameter. Therefore an object of the present embodiment is to ~~reduce the~~ avoid enlargement of the diameter ~~measurement~~, and to provide a compact automatic transmission.

According to ~~the present~~ This twentieth embodiment, all clutches can be configured without enlarging the diameter ~~measurement~~ of the ~~linking~~ transmitting member, ~~by configuring~~ because a clutch C3 with a small capacity is provided ~~on the linking member, particularl~~y on the inner ~~circumference~~ side of the transmitting member 230.

Twenty-first Embodiment

~~Below, the~~ A twenty-first embodiment~~, which~~ is a partial modification of the eighteenth embodiment and will be described, with reference to Fig. 39. ~~Fig. 39 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the twenty-first embodiment. Now,~~ Components of the twenty-first embodiment which are the same as those of the eighteenth embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof will be omitted here, except for ~~partial~~ modified components ~~modifications~~.

As Fig. 39 illustrates, the automatic transmission device 1_{21} of the ~~automatic transmission relating to the~~ twenty-first embodiment ~~is a modification of the~~ differs from the eighteenth embodiment in the configuration of the clutch C1 and that of the second planetary gear unit PR. ~~in~~ More

in the diagram

specifically ~~other words~~, the second planetary gear unit PR and the clutch C1 are ~~configured~~ on the right side ~~of the diagram~~ of the planetary gear unit PU, and the counter gear 5 is located ~~configured in~~ between the ~~this~~ planetary gear units PR and ~~the planetary gear unit~~ PU. ~~compared to that of the automatic transmission device 1_{18} of the automatic transmission of the eighteenth embodiment (see Fig. 30).~~

Within the automatic transmission ~~device~~ 1_{21} is ~~on the radially inner circumference side of the input shaft 2 is configured~~ a multi-disc clutch C1 comprising a hydraulic ~~an oil pressure~~ servo 11, ~~a~~ friction plates 71, a clutch drum ~~-shaped member~~ 221 ~~that forms a clutch drum~~, a hub unit 222 connected ~~connecting~~ to a sun gear S3, and radially outward of clutch C1 is ~~on the outer circumference side is comprised~~ a multi-disc clutch C2 comprising hydraulic ~~an oil pressure~~ servo 12, ~~a~~ friction plates 72, a clutch drum ~~-shaped member~~ 223 and ~~that forms a clutch drum,~~ a hub unit 224. Further, radially outward of ~~on the outer circumference side of~~ the hub ~~unit~~ 224 is ~~located~~ ~~comprised~~ a multi-disc brake B2 comprising a hydraulic ~~an oil pressure~~ servo 15 and ~~a~~ friction plates 75.

The ~~above-mentioned~~ input shaft 2 is rotatably supported by the ~~above-mentioned~~ clutch drum ~~-shaped member~~ 221 ~~so as to be capable of rotating~~, and ~~on the~~ a front edge portion of the inner circumferential surface ~~circumference side~~ of this drum ~~-shaped member~~ 221 is splined to ~~configured~~ the friction plates 71 of the clutch C1, which ~~as~~ friction plates 71 ~~capable of engaging by the oil pressure servo 11 for the clutch C, splined, and is connected so that the inner~~

are intermeshed with ~~circumference side of the~~ friction plates ~~71 of this clutch C1 is~~ splined to the hub unit 222.

Further, the sun gear S1 is fixed to and supported by the ~~above-mentioned~~ boss ~~unit~~ 3a, and the carrier CR1 is connected to the input shaft 2 via a ~~the~~ side plate. The ring gear 1 is rotatably supported by the boss ~~unit~~ 3a ~~so as to be capable of rotating~~, and also is connected to the ~~above mentioned~~ clutch drum ~~-shaped member~~ 221. Further, the ~~above-mentioned~~ hub unit 222 is connected to the sun gear S3 ~~transmitting member 230, and this~~ by transmitting member, ~~230 is connected to the above-mentioned sun gear S3.~~

Now, the oil chamber of the hydraulic ~~oil pressure~~ servo 11 is connected ~~linked~~ to the oil line 2a which is formed on the ~~above mentioned~~ input shaft 2, and ~~this oil line 2a~~ is connected ~~linked~~ to the oil line 91 in ~~of~~ the boss ~~unit~~ 3a which, in turn, is connected ~~provided on the input shaft 2 in a sleeve form, and this oil line 91 is linked~~ to the oil pressure control device. ~~not illustrated~~. This hydraulic ~~oil pressure~~ servo 11 comprises one set of seal rings 81 ~~that seal~~ between the boss ~~unit~~ 3b of the case 3 and the input shaft 2, and one set of seal rings 85 ~~that seal~~ between the input shaft 2 and the clutch drum ~~-shaped member~~ 221. Thus, ~~in other words, uses~~ two sets of seal rings connect ~~and constructs an~~ oil supply ~~line~~ from the oil pressure control device ~~not illustrated~~ to the oil chamber of the hydraulic ~~oil pressure~~ servo 11.

~~On the other hand, on~~ At the other end ~~side~~ of the input shaft

2 (left side in diagram) is ~~configured~~ a multi-disc clutch C that comprises ~~an oil pressure~~ a hydraulic servo 13, ~~a~~ friction plates 73, a clutch drum~~-shaped member~~ 225 ~~that forms a clutch drum~~, and a hub unit 226. The friction plates 73 ~~is~~ are splined ~~with the~~ to a front edge portion of the inner ~~circumference side~~ surface of the clutch drum~~-shaped member~~ 225 of this clutch C3, and ~~this~~ friction plates 73 ~~is~~ are intermeshed with friction plates splined ~~with~~ to the front edge of the outer circumferen~~ce side~~tial surface of the hub unit 226, and this hub unit 226 is connected to the side plate of the carrier CR2.

The oil chamber of ~~this oil pressure~~ servo 13 is connected to an oil line 2b which is formed on the above-mentioned input shaft 2, and this oil line 2b ~~is provided along the edge of the case 3 that is the opposite side of that of the above mentioned boss unit 3a, and~~ is connected to the oil line 93 of the boss ~~unit~~ 3b, which ~~is provided on~~ boss 3b forms a sleeve around one end of the input shaft 2~~, in a sleeve form~~. Therefore, an oil line from the oil pressure control unit, not illustrated, to the oil chamber of the ~~oil pressure~~ hydraulic servo 13 is constructed ~~on the above-mentioned oil pressure servo 13,~~ simply by providing one set of seal rings 82 ~~to seal~~ between the boss ~~unit~~ 3a of the case 3 and the clutch drum~~-shaped member~~ 225.

~~On the other hand,~~ On the radially outer ~~circumference~~ side of the planetary gear unit PU is ~~configured~~ a multi-disc brake B1 comprising ~~an oil pressure~~ a hydraulic servo 14, ~~a~~ friction plates 74, and a hub unit 228. The side plate of the carrier CR2 of

the ~~above-mentioned~~ first planetary gear unit PU is connected to the hub unit 228 that is ~~splined~~ to friction plates intermeshed with the friction plates 74 of the ~~above-mentioned~~ brake B1, and further, the hub unit 228 is connected to the inner race of the one-way clutch F1. The sun gear S3 is meshed with the short pinion PS of this carrier CR2 ~~. Then~~ and the long pinion PL of this carrier CR2 is meshed with the ~~above-mentioned~~ sun gear S2 and the ring gear 2. ~~and to~~ One edge of this ring gear R2 is connected to ~~the linking member 227, and this ring gear R2 is linked to~~ the counter gear 5 via ~~this linking~~ transmitting member 227.

The operations of the automatic transmission ~~device~~ 1_{21} differs from those of the eighteenth embodiment in that, ~~based on the above-mentioned construction are as follows.~~ within the second planetary gear unit PR, the carrier CR1 and the sun gear S1 have switched positions. In other words, the sun gear S1 is fixed, and the rotation of the input shaft 2 is input to the carrier CR1, but the other ~~parts~~ components are the same as those of the eighteenth embodiment (see Fig. 31 and Fig. 32), and accordingly description will be omitted.

~~As described above, according to~~ In the automatic transmission device 1_{21} ~~relating to the present invention~~ of the Twenty-First embodiment, due to the planetary gear PR and the clutch C2 being ~~configured~~ located on one side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C3 being ~~configured~~ located on the other axial side ~~in the axial direction~~ of the first planetary gear unit PU, the planetary gear units PR and ~~the planetary gear~~

~~unit~~ PU can be located more ~~configured~~ closely together, as compared to an ~~the~~ embodiment ~~case~~ wherein, for example, two clutches C2 and C3 are located ~~configured in~~ between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 230 ~~for~~ which transmits ~~ting~~ reduced speed rotation can be made relatively shorter ~~ed.~~ By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are located ~~configured~~ on one side of the planetary gear unit PU, the oil lines (for example, 2a, 2b, 91, 92, 93) that supply the hydraulic ~~oil pressure~~ servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed easily, ~~and~~ the manufacturing process can be simplified and the costs can be reduced ~~brought down~~.

Further, since the counter gear 5 is located ~~configured in the~~ axial ~~direction~~ between the planetary gear units PU and ~~the planetary gear~~ PR, the counter gear 5 can be located ~~configured~~ in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, when the automatic transmission is mounted on the vehicle, need for enlargement in ~~ing towards~~ one direction ~~of the axis~~ (particularly in the rear direction when the ~~input~~ side facing ~~from~~ the drive source is the "front" ~~direction~~) can be avoided ~~prevented~~ because the counter gear 5

is mounted ~~to match~~ adjacent the drive wheel transmission device. Because of this, particularly in the case of ~~a~~ an FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, and the mountability on a vehicle can be improved such ~~as~~ that the steering angle ~~being~~ can be greatly increased, for example.

Further, the automatic transmission ~~device~~ 1_{21} ~~according to the present embodiment is a transmission device that~~ is directly coupled ~~at~~ in fifth speed forward. Therefore, ~~at~~ in first speed forward and fourth speed forward, the gear ratio can be specified ~~in a detailed manner~~ for better efficiency, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be ~~utilized with better revolutions~~ operated more efficiently, and ~~this contributes to increased~~ fuel economy ~~of the vehicle~~ is increased while running at a low to medium speed.

Twenty-second Embodiment

~~Below, the~~ A twenty-second embodiment, which is a partial modification of the twenty-first embodiment, will now be described with reference to Fig. 40. Fig. 40 is a schematic cross-sectional diagram illustrating the automatic transmission ~~device of an automatic transmission relating to~~ of the twenty-second embodiment. ~~Now,~~ Components of the twenty-second embodiment which are the same as those of the twenty-first embodiment ~~will be~~ are denoted ~~with~~ by the same reference numerals, and description thereof omitted, except

for ~~partial~~ modifi~~cations~~ed components.

As Fig. 40 illustrates, the automatic transmission ~~device~~ 1_{22} of the ~~automatic transmission relating to the~~ twenty-second embodiment ~~is a modification of the~~ differs from that of the Twenty-first embodiment in the configuration of the second planetary gear unit PR and the clutch C2, and further ~~comprised~~ differs in that a brake B3 is utilized instead of ~~a~~ clutch C1, ~~and~~ which enables the carrier CR1 of the second planetary gear unit PR to be fixed by the brake B3. ~~compared to that of the automatic transmission device 1_{21} of the automatic transmission of the twenty-first embodiment (see Fig. 39)~~.

Within this automatic transmission ~~device~~ 1_{22}, the brake B3 is ~~configured~~ located on the ~~opposite~~ side (the right side of the diagram) of the second planetary gear unit ~~PU of~~ PR opposite the planetary gear unit PR. This brake B3 comprises ~~an oil pressure~~ a hydraulic servo 16, ~~a~~ friction plates 76, and a hub unit 233. ~~and this~~ Hub unit 233 is connected to the sun gear S1 ~~in the form of being~~ and is rotatably supported by the boss ~~unit~~ 3a. ~~so as to be capable of rotating.~~ Further, the clutch C2 compris~~ing an oil pressure~~es a hydraulic servo 12, ~~a~~ friction plates 72, a drum ~~-shaped member~~ 223, and a hub unit 224 and is ~~configured~~ located on the outer ~~circumference~~ side of the hub unit 233 of ~~this~~ brake B3. The drum ~~-shaped member~~ 223 of this clutch C2 is connected to one side plate of the carrier CR1, and the other side plate of ~~this~~ carrier CR1 is connected to the input shaft 2. Also, the ring gear R1 is ~~connected to the transmitting member 230, and is~~

connected to the sun gear S3 via ~~this~~ transmitting member 230.

~~Now,~~ The oil chamber of the hydraulic ~~oil pressure~~ servo 12 is linked to the oil line 91 of the boss ~~unit~~ 3a provided on the input shaft 2 in a sleeve form, via an oil hole (not illustrated) formed in the hub unit 233, and this oil line 91 is linked to the oil pressure control device, ~~not illustrated~~. This hydraulic ~~oil pressure~~ servo 11 comprises one set of seal rings 80 ~~that seal~~ between the boss ~~unit~~ 3a of the case 3 and the hub unit 233, and one set of seal rings 86 ~~that seal~~ between the hub unit 233 and the drum~~-shaped~~ ~~member~~ 223. In other words, ~~uses~~ two sets of seal rings ~~and~~ construct~~s~~ an oil line from the oil pressure control device ~~not illustrated~~ to the oil chamber of the hydraulic ~~oil pressure~~ servo 12.

The ~~operations of the~~ automatic transmission ~~device~~ 1_{22} of this twenty-second embodiment differ from that of the twentieth embodiment ~~based on the above-mentioned construction are as follows.~~ in that, within the second planetary gear unit PR, the carrier CR1 and the sun gear S1 have switched positions; in other words, the sun gear S1 is fixed by the brake B3, and the rotation of the input shaft 2 is input to the carrier CR1, but the other components are the same as those of the twentieth embodiment (see Fig. 37 and Fig. 38), and accordingly description thereof will be omitted.

~~As described above, according to~~ In the automatic

transmission ~~device~~ 1_{22} of the Twenty-second embodiment, ~~relating to the present invention~~, due to the second planetary gear unit PR and the clutch C2 being located ~~configured~~ on one side ~~in the axial direction~~ of the planetary gear unit PU, and the clutch C3 being located ~~configured~~ on the axially opposite ~~other~~ side ~~in the axial direction~~ of the first planetary gear unit PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be located more ~~configured~~ closely together, as compared with in embodiment ~~the case~~ wherein, for example, two clutches C2 and C3 are located ~~configured in~~ between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 230 for transmitting reduced speed rotation can be made relatively shorter ~~shortened~~. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force ~~of~~ inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced.

Further, since the counter gear 5 is located ~~configured in the axial direction~~ between the first planetary gear unit PU and the second planetary gear unit PR, the counter gear 5 can be located ~~configured~~ in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, when the automatic transmission is mounted on the vehicle, enlargement in ~~enlarging towards~~ one direction ~~of the axis~~ (particularly in the rear direction when the ~~input~~ side facing ~~from~~ the drive source is the front ~~direction~~) can be prevented because the counter gear 5

is mounted ~~to match~~ adjacent the drive wheel transmission device. Because of this, particularly in the case of ~~an~~ a FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, ~~and~~ the mountability on a vehicle ~~can be~~ is improved, and the ~~such as the~~ steering angle ~~being~~ is greatly increased. ~~for example.~~

Further, since the reduced speed rotation output to the first planetary gear unit PU from the second planetary gear unit PR is ~~made to be~~ engaged and disengaged by the brake B3, the number of ~~parts~~ components (for example drum-shaped members and so forth) can be reduced as compared to the case wherein, for example, a clutch C1 is provided. Further, the brake B3 can ~~configure~~ connect with an oil line directly from the case 3, and therefore the configuration of the oil line can be simplified as compared to the case wherein, for example, a clutch C1 is provided.

Further, the automatic transmission device 1_{22} according to the present embodiment ~~is a transmission device that~~ is directly coupled ~~at~~ in fifth speed forward. Therefore, ~~at~~ in first speed forward and fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ better set for maximum efficiency, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be ~~utilized with better revolutions~~ operated more efficiently, and ~~this contributes to increased~~ fuel economy ~~of the vehicle~~ while running at a low to medium speed can be improved.

~~Now, in the event that~~ Is a clutch is ~~configured in~~ located

between the planetary gear units PR and ~~the planetary gear unit~~ PU for example, the length of the ~~linking member (particularly the~~ transmitting members that links the planetary gear units PR and ~~the planetary gear unit~~ PU becomes axially longer ~~in the axial direction~~, and since this linking member ~~is for~~ transmits ~~transmitting~~ the reduced speed rotation, the thickness of the member must be increased so as to withstand the high torque ~~this~~, and therefore the weight also increases. Therefore, an object of the present invention is to provide an automatic transmission that can shorten the distance between the speed reduction (second) planetary gear unit PR and the first planetary gear unit PU, and avoid ~~reduce the~~ increase in weight.

In this twenty-second ~~With the present~~ embodiment, ~~in particular,~~ the clutch C2 is disposed on the ~~opposite~~ side ~~in the axial direction~~ of the second planetary gear unit PR axially opposite ~~PU from~~ the first planetary gear unit PU ~~PR~~, and therefore, ~~providing~~ a clutch between the planetary gear units PR and ~~the planetary gear unit~~ PU is not necessary, and the length of the ~~linking member, particularly the~~ transmitting member 230 can be made that much shorter. Therefore, ~~an~~ increase in weight of the automatic transmission as a whole can be avoided ~~prevented~~.

Twenty-third Embodiment

A ~~Below, the~~ twenty-third embodiment, which is a partial modification of the eighteenth embodiment will now be described, with reference to Fig. 41. ~~Fig. 41 is a schematic cross-~~

~~sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the twenty-third embodiment. Now~~, Components ~~components~~ of the twenty-third embodiment which are the same as those of the eighteenth ~~twenty-third~~ embodiment are ~~will be~~ denoted by ~~with~~ the same reference numerals, and description thereof omitted, except for ~~partial~~ modified components ~~modifications~~.

As Fig. 41 illustrates, the automatic transmission ~~device~~ 1_{23} of the ~~automatic transmission relating to the~~ twenty-third embodiment differs from the eighteenth embodiment ~~is a modification of the~~ in the configuration of the clutch C1 and the second planetary gear unit PR. ~~in other words~~ More specifically, the second planetary gear unit PR and the clutch C1 are located on one side ~~configured to~~ (the right side in ~~of~~ the diagram) of the first planetary gear unit PU, and the counter gear 5 is located ~~configured in~~ between the ~~this~~ planetary gear units PR and ~~the planetary gear unit~~ PU. ~~, and further,~~ The twenty-third embodiment also differs in that the locations of the clutch C2 and the brake B2 ~~change places with the clutch C3,~~ are switched as compared to ~~that of~~ the automatic transmission ~~device~~ 1_{18} of the ~~automatic transmission of the~~ eighteenth embodiment (see Fig. 30).

Within the automatic transmission ~~device~~ 1_{23}, mounted on the ~~inner circumference side of the~~ input shaft 2 is ~~configured~~ a multi-disc clutch C3 comprising a hydraulic ~~an oil pressure~~ servo 13, ~~a~~ friction plates 73, a clutch drum~~-shaped member~~ 225 ~~that forms a clutch drum~~, a hub unit 226 connected ~~connecting~~ to ~~a~~ sun gear S2, and, located radially outward of clutch C3 ~~on the outer circumference side~~, is ~~comprised~~ a multi-disc

clutch ~~C8~~ Cl comprising ~~an oil pressure~~ a hydraulic servo 11, ~~a~~ friction plates 71, a clutch drum~~-shaped member~~ 221 ~~that forms a clutch drum~~, and a hub unit 224.

~~Now,~~ The the oil chamber of the ~~oil pressure~~ hydraulic servo 13 is ~~linked~~ connected to the oil line 2a formed on the ~~above-mentioned~~ input shaft 2, and this oil line 2a ~~is extended from one edge of the case 3, and~~ is ~~linked~~ connected to the oil line 91 of the boss ~~unit~~ 3a, ~~provided on the input shaft 2 in a sleeve form,~~ ~~and this~~ which oil line 91, in turn, is ~~linked~~ connected to the oil pressure controller ~~device~~ not illustrated. ~~In other words~~ Thus, ~~since~~ because the ~~above-mentioned oil pressure~~ hydraulic servo 13 is ~~configured~~ mounted on the input shaft 2, simply providing one set of seal rings 81 ~~that seal~~ between the boss ~~unit~~ 3a ~~of the case 3~~ and the input shaft 2 ~~configures an~~ serves to connect oil ~~line~~ supply from the oil pressure controller ~~device not illustrated~~ to the oil chamber of the ~~oil pressure~~ hydraulic servo 13.

Further, the oil chamber of the ~~above-mentioned oil pressure~~ hydraulic servo 11 is ~~linked~~ connected to the oil line 92 of the ~~above-mentioned~~ boss ~~unit~~ 3a, ~~and this~~ which oil line 92, in turn, is ~~linked~~ connected to the oil pressure controller. ~~device not illustrated. In other words~~ Thus, ~~regarding the above-mentioned oil pressure~~ for the hydraulic servo 11, simply by providing one set of seal rings 80 ~~that seal~~ between the boss ~~unit~~ 3a ~~of the case 3~~ and the clutch drum~~-shaped member~~ 221, ~~configures an~~ oil ~~line~~ supply from the oil pressure controller ~~device, not illustrated,~~ is connected to the oil chamber of the ~~oil~~ hydraulic

~~pressure~~ servo 11.

The ~~above mentioned~~ input shaft 2 is connected to the clutch drum~~-shaped member~~ 225 of the clutch C3, and the front ~~edge~~ portion of the inner ~~circumference side~~ surface of this clutch drum~~-shaped member~~ 225 is ~~configured~~ splined with the friction plates 73. ~~that is made capable of engaging with the oil pressure servo 13 for the clutch C3. The inner circumference side of this~~ Friction plates 73 ~~is~~ are intermeshed with friction plates splined to the hub unit 226, and ~~this~~ hub unit 226 is connected to the sun gear S2.

~~Further, the above mentioned~~ The input shaft 2 ~~is connected to~~ rotatably supports the ~~above mentioned~~ clutch drum~~-shaped member~~ 221~~, so as to be capable of rotating, and on the~~ The inner ~~circumference side~~ surface of this clutch drum~~-shaped member~~ 221 is ~~configured~~ splined to the friction plates 71 of the clutch C1 which is ~~capable of engaging by the oil pressure~~ operated by the hydraulic servo 11 ~~for the clutch C1, splined~~, and these ~~inner circumference side of the~~ friction plates 71 ~~of this clutch C1 is connected by~~ are intermeshed with friction plates splined to the hub unit 222 that is connected to the ring gear R1. ~~This~~ Ring gear R1 is rotatably supported by the boss ~~unit~~ 3a ~~so as to be capable of rotating,~~ via ~~this~~ hub unit 222. ~~Further,~~ The sun gear S1 is connected to the ~~above mentioned~~ input shaft 2, and the carrier CR1 is fixed to and supported by the boss ~~unit~~ 3a via ~~the~~ a side plate. Also, the ~~above mentioned~~ clutch drum~~-shaped member~~ 221 is connected to the sun gear S3 via the transmitting member 230. ~~and this transmitting member 230 is connected to the above~~

~~mentioned sun gear 83.~~

~~On the other hand, on~~ ~~t~~The boss ~~unit~~ 3b of the case 3 is in the form of a sleeve fitted ~~that is provided~~ on one end of the input shaft 2 ~~in a sleeve form~~, and ~~is~~ extend~~ed from the other side~~ing ~~as~~ a sleeve on the opposite ~~from the above~~ end of input shaft 2 ~~mentioned~~ is a boss ~~unit~~ 3a, ~~is comprised~~ which supports a multi-disc clutch C1 comprising ~~an oil pressure~~ a hydraulic servo 12, ~~a~~ friction plates 72, a clutch drum~~-shaped member~~ 223 ~~that forms a clutch drum,~~ and a hub unit 224. The oil chamber of ~~this oil pressure~~ hydraulic servo 12 is ~~linked~~ connected to ~~the~~ oil line 93 of the boss ~~unit~~ 3b, ~~and this~~ which oil line 93, in turn, is ~~linked~~ connected to the oil pressure controller ~~device not illustrated.~~ In other words, the above-mentioned ~~oil pressure~~ hydaulic servo 12 is ~~constructing an oil line from~~ connected to the oil pressure controller ~~device not illustrated to the oil pressure servo 12~~ by one set of seal rings 84 ~~that seal~~ between the boss ~~unit~~ 3b ~~of the case 3~~ and the clutch drum~~-shaped member~~ 223.

~~Further, on the~~ A front ~~edge~~ portion of the inner ~~circumference side~~ surface of the clutch drum~~-shaped member~~ 223 ~~of this clutch C2~~ is splined ~~a~~ to friction plates 72 ~~capable of engaging by the oil pressure servo 12 of the clutch C2, and this friction plate 72 is~~ which are intermeshed with friction plates splined ~~with the~~ to a front ~~edge~~ portion of the outer ~~circumference side~~ surface of the hub unit 224. Further, ~~on the outer circumference side~~ radially outward of the clutch C2 is ~~configured~~ a multi-disc brake comprising an oil pressure servo 15 and ~~a~~ friction plates 75, and ~~on~~ the outer circumferen~~ce side~~tial surface of ~~this~~ the hub unit 224 is splined ~~a~~ to friction plates 75 that can be

~~retained~~ engaged by operation of the ~~oil pressure~~ hydraulic servo 15 ~~for the brake B2, and~~ ~~a~~Also, this hub unit 224 is connected to the sun gear S2.

~~On the other hand, on the outer circumference side~~ Radially outward of the planetary gear unit PU is ~~configured~~ a multi-disc brake B1 comprising ~~an oil pressure~~ a hydraulic servo 14, ~~a~~ friction plates 74, and a hub unit 228. The side plate of the carrier CR2 of the ~~above-mentioned~~ first planetary gear unit PU is connected to the hub unit 228 that is splined ~~with~~ to the friction plates ~~74~~ of the above-mentioned brake B1, and further, the hub unit 228 is connected to the inner race of the one-way clutch F1. The sun gear S3 is meshed with the short pinion PS of this carrier CR2. ~~Then, t~~The long pinion PL of this carrier CR2 meshes with the ~~above-mentioned~~ sun gear S2 and the ring gear R2, and to one edge of this ring gear R2 is connected the ~~linking~~ transmitting member 227, and ~~this~~ ring gear R2 is linked to the counter gear 5 via this ~~linking~~ transmitting member 227.

The operations of the automatic transmission ~~device~~ 1_{23}, of this twenty-third embodiment ~~based on the above-mentioned construction,~~ are similar to ~~that~~ those of the eighteenth embodiment (see Fig. 31 and Fig. 32), and, accordingly, description thereof will not be ~~omitted~~ repeated here.

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_{23} ~~relating to the present invention~~ of this embodiment, due to the second planetary gear unit PR and the clutch C3 being ~~configured~~ located on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 being ~~configured~~ located

on the ~~other~~ side ~~in the~~ axial opposite ~~direction~~ of the first planetary gear unit PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be located more ~~configured~~ closely together, as compared to the case wherein, for example, two clutches C2 and C3 are located ~~configured in~~ between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 230 for transmitting reduced speed rotation can be relatively shorter~~ned~~. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertia (force of inertia) can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are located ~~configured~~ on one side of the first planetary gear unit PU, the oil lines (for example, 2a, 91, 92, 93) that supply the oil pressure servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed more easily, ~~and~~ the manufacturing process can be simplified and the costs can be reduced ~~brought down~~.

Further, since the hydraulic ~~oil pressure~~ servo 13 is mounted ~~provided~~ on the input shaft 2, one set of seal rings 81 serves to connect ~~seal the case 3~~ the ~~and~~ supply oil to the oil lines 2a provided within input shaft 2, and therefore oil can be supplied to the oil chamber of oil pressure servo 13 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the hydraulic ~~oil pressure~~ servo 12. Further, the hydraulic ~~oil pressure~~ servos 11 and

12 can receive supply as oil directly from the boss es ~~units~~ 3a, 3b extend ~~ed~~ ing from the case 3, without passing through other components. ~~parts for example~~, ~~and therefore can supply oil by providing one set of seal~~ rings 80, 84. Therefore, oil can be supplied simply by providing one set of seal rings 81, 80, 84 each for of the ~~oil~~ hydraulic ~~pressure~~ servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, because the clutch C3 is located radially inward ~~configured on the inner circumference side~~ of the clutch C1, the clutch C1, which must transmit a relatively large torque in order to transmit the reduced speed rotation, can be located ~~configured~~ on the outer circumference side, and its hydraulic ~~this clutch C1 and the oil pressure~~ servo 11 ~~thereof~~ can have an increased diameter. Thus ~~Particularly~~, the pressure receiving area of the hydraulic ~~oil pressure~~ servo 11 can be enlarged, and the ~~capacity capable of~~ torque transmitting ~~transmission~~ capacity of this clutch C1 can be increased. By configuring the clutch C3 to ~~which can~~ have a smaller capacity ~~for~~ torque transmitting ~~transmission~~ than ~~compared to the~~ clutch C1, the automatic transmission can be made more compact.

Because when ~~Further, because~~ clutch C2 ~~is a clutch that engages while at first speed reverse, when this clutch 2~~ is engaged in ~~at~~ first speed reverse, the transmitting member 230 rotates in the opposite direction while the hub unit 224 that

connects ~~this~~ clutch C2 and the sun gear S2 rotates in ~~at~~ the same direction ~~rotation~~ as the input shaft 2 ~~by engaging this clutch C2, which may lead to cases wherein the rotation difference of~~ the transmitting member 230 and the hub unit 224 rotate at ~~becomes~~ greatly different speeds, but because this clutch C2 is located on the ~~opposite~~ side of the first planetary gear unit PU opposite ~~PR, via~~ the second planetary gear unit PR ~~PU~~, the transmitting member 230 and the hub hunt 224 can be spaced ~~configured~~ apart from one another. Compared to the case wherein, for example, these components ~~parts~~ come into contact in ~~due to~~ a multiple axis construction, the decrease in efficiency of the automatic transmission caused by the friction produced by the relative rotation between These components ~~those parts~~ can be avoided ~~prevented~~.

Further, because the counter gear 5 is ~~configured in the axial direction~~ located between the planetary gear units PU and ~~the planetary gear~~ PR, the counter gear 5 can be located ~~configured~~ in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, enlargement of ~~when~~ the automatic transmission toward the rear of ~~is mounted on~~ the vehicle ~~, enlarging towards one direction of the axis (particularly in the rear direction~~ (when the input side facing ~~from~~ the drive source is the front ~~direction~~) is not necessary ~~can be prevented~~ because the counter gear 5 is mounted adjacent ~~to match~~ the drive wheel transmission device. Because of this, particularly in the case of a ~~an~~ FF vehicle, ~~the~~ interference with ~~toward~~ the front wheels is reduced, ~~and~~ the mountability on a vehicle is ~~can be~~ improved, and ~~such as the~~

the steering angle can be ~~being~~ greatly increased. ~~for example~~.

Further, the automatic transmission ~~device~~ 1_{23} according to the present embodiment is ~~a transmission device that is~~ directly coupled in ~~at~~ fifth speed forward. Therefore, in ~~at~~ first speed forward and fourth speed forward, the gear ratio can be determined for greater efficiency ~~specified in a detailed manner~~, ~~and particularly~~ when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be operated more efficiently ~~utilized with better revolutions~~, and ~~this contributes to increased~~ fuel economy of the vehicle can be increased when ~~while~~ running at a low to medium speed.

~~Now, the linking member (in particular~~ The transmitting member(s) for linking the planetary gear units PR and ~~the planetary gear unit~~ PU requires rigidity to withstand the reduced speed torque that is input. For example, ~~in the case of configuring~~ a clutch that engages at a slow to medium speed and ~~or~~ a clutch that engages and disengages reduced speed rotation and that is located ~~on the inner circumference side~~ radially inward of the linking member ~~, the clutches~~ must have a large capacity, and therefore ~~an~~ must have a ~~appropriate~~ diameter ~~to~~ corresponding to ~~with~~ this required large capacity ~~becomes necessary~~. Therefore, in the event that the transmitting ~~linking~~ member ~~is the type that~~ passes radially outward ~~on the outer circumference side~~ of such a ~~this type of~~ clutch, an even ~~a~~ larger diameter ~~than the necessary diameter measurement of those~~ for the clutch ~~es~~ becomes necessary, ~~and~~ the diameter ~~measurement~~ of the transmitting ~~linking~~

member ~~is~~ must be further enlarged ~~more than necessary~~, and the diameter of the automatic transmission as a whole becomes greater. ~~in the direction of the diameter~~. Therefore an object of the present embodiment is to reduce the ~~enlargement of the~~ diameter ~~measurement~~, and to provide a more compact automatic transmission.

According to the present embodiment, all clutches can be designed to avoid ~~configured without~~ enlarging the diameter ~~measurement~~ of the transmitting ~~linking~~ member, by designing ~~configuring a~~ clutch C3 to have ~~with~~ a small capacity and to be located ~~on the linking member, particularly on the inner circumference side~~ radially inward of the transmitting member 230.

Twenty-fourth Embodiment

~~Below,~~ The twenty-fourth embodiment ~~, which~~ is a partial modification of the twenty-third embodiment and will be described ~~,~~ with reference to Fig. 42. ~~Fig. 42 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the forty-second embodiment. Now,~~ Components of the twenty-fourth embodiment which are the same as those of the twenty-third embodiment are ~~will be~~ denoted by ~~with~~ the same reference numerals, and description thereof will not be repeated here ~~omitted~~, except for ~~partial~~ modified components ~~modifications~~.

As Fig. 42 illustrates, the automatic transmission ~~device~~ 1_{24} of the ~~automatic transmission relating to the~~ twenty-third embodiment is ~~a~~ modified with respect to the ~~modification of the~~ configuration of the clutch C1, as compared to that of the

automatic transmission ~~device~~ 1_{23} of the ~~automatic transmission of the~~ eighteenth embodiment (see Fig. 41).

Within the automatic transmission ~~device~~ 1_{24}, the clutch C1 is ~~configured~~ located on the side of the second planetary gear unit PR, ~~on the~~ opposite (right side on the diagram) ~~from~~ the first planetary gear unit PU. ~~The~~ A front ~~edge~~ portion of the inner circumferen~~ce side~~tial surface of the drum ~~shaped member~~ 221, which ~~of this clutch C1~~ is connected to the input shaft 2, ~~On the front edge of the inner circumference side of the drum-shaped member 221 of this clutch C1 is~~ is splined ~~with the~~ to friction plates 71, which are intermeshed with friction plates ~~and the inner circumference side of this friction plate 71 is~~ splined ~~with~~ to the hub unit 222. The hub unit 222 is connected to the sun gear S1 of the second planetary gear unit PR.

~~Further,~~ The side plate of the carrier CR1 of the second planetary gear unit PR is fixed to and supported by the case 3. ~~Also,~~ The ring gear R1 is connected to the sun gear S3 by the transmitting member 230. ~~and this transmitting member 230 is connected to the sun gear S3.~~ ~~Now,~~ The clutch C3 compris~~ing an oil pressure~~es a hydraulic servo 13, ~~a~~ friction plates 73, a drum ~~shaped member~~ 225, and a hub unit 226 and is located ~~configured on the inner circumference side~~ radially inward of the ~~above-mentioned~~ transmitting member 230, that is to say, ~~is~~ enclosed within ~~this~~ transmitting member 230.

The operations of the automatic transmission ~~device~~ 1_{24}, ~~based on the above-mentioned construction~~ are the same as

those ~~that~~ of the nineteenth embodiment (see Fig. 34 and Fig. 35), and accordingly description thereof will not be repeated here. ~~omitted.~~

~~As described above, according to~~ In the automatic transmission ~~device~~ 1_{24}, ~~relating to the present invention,~~ because the second planetary gear unit PR and the clutch C3 are ~~is~~ located ~~configured~~ on one side ~~in the axial direction~~ of the first planetary gear unit PU, and the clutch C2 is located ~~configured~~ on the other (axially opposite) side ~~in the axial direction~~ of the first planetary gear unit PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be located more ~~configured~~ closely together, as compared to the case wherein, for example, two clutches C2 and C3 are located ~~configured in~~ between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 230 for transmitting the reduced speed rotation can be relatively shorter~~ned~~. By doing so, the automatic transmission can be made more compact and more lightweight. Further, because the inertial (force) ~~of inertia~~ can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced. Further, compared to the case wherein three clutches C1, C2, C3 are located ~~configured~~ on one side of the planetary gear unit PU, the oil lines (for example, 2a, 91, 92, 93) that supply the hydraulic ~~oil pressure~~ servos 11, 12, and 13 of these clutches C1, C2, C3 can be constructed more easily, ~~and~~ the manufacturing process can be simplified and the costs can be reduced ~~brought down~~.

Further, because the ~~oil pressure~~ hydraulic servo 13 is ~~provided~~ mounted on the input shaft 2, one set of seal rings 81 seal the case 3 ~~and supply oil to~~ with the oil lines 2a provided within input shaft 2~~, and therefore oil can be~~ to suppl~~ied~~y oil to the oil chamber of ~~oil pressure~~ hydraulic servo 13 without providing ~~the~~ seal rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servo 13. Further, the ~~oil pressure~~ hydraulic servos 11 and 12 can receive supply of oil directly from the boss~~ units~~es 3a, 3b extend~~ed~~ings from the case 3, without passing through other ~~parts for example~~ components, and therefore ~~can~~ the supply oil can be connected by providing one set of seal rings 80, 84. Therefore, oil can be supplied simply by providing one set of seal rings 81, 80, 84 each for of the ~~oil pressure~~ hydraulic servos 11, 12, and 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, ~~since~~ when the clutch C2 ~~is a clutch that engages while at first speed reverse, when this clutch 2~~ is engaged ~~at~~ in first speed reverse, the transmitting member 230 rotates in the opposite direction while the hub unit 224 that connects this clutch C2 and the sun gear S2 rotates ~~at~~ in the same ~~rotation~~ direction as the input shaft 2~~, by engaging this clutch C2.~~ Accordingly, the case may occur wherein the ~~rotation difference of~~ the transmitting member 230 and the hub unit 224 ~~becomes~~ rotate at greatly different speeds. However, ~~great, but~~ because this clutch C2 is located on the ~~opposite~~ side of the first planetary gear unit PU opposite ~~PR, via~~ the second planetary gear unit PR

~~Thus~~, the transmitting member 230 and the hub hunt 224 can be spaced ~~configured~~ apart from one another. Compared to the case wherein, for example, those components ~~parts~~ come into contact due to a multiple axis construction, a ~~the~~ decrease~~d~~ efficiency of the automatic transmission caused by the friction produced by the relative rotation between those components ~~parts~~ can be avoided ~~prevented~~.

Further, because the counter gear 5 is located ~~configured in~~ ~~the~~ axially ~~direction~~ between the planetary gear units PU and PR ~~the planetary gear PR~~, the counter gear 5 can be located ~~configured~~ in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. For example, when the automatic transmission is mounted on a ~~the~~ vehicle, enlargement ~~ing~~ towards ~~one direction of the axis (particularly in~~ the rear ~~direction~~ when the input side from the drive source is the "front" ~~direction~~) is not necessary ~~can be prevented~~ because the counter gear 5 is mounted to mate with ~~match~~ the drive wheel transmission device. Because of this, particularly in the case of a~~n~~ FF vehicle, ~~the~~ interference with ~~toward~~ the front wheels is reduced, ~~and~~ the mountability on a vehicle is ~~can be~~ improved, and ~~such as~~ the steering angle can be ~~being~~ greatly increased. ~~for example.~~

~~Further,~~ If the clutch C1 were to be ~~is~~ placed between the ring gear R1 and the sun gear S3, for example, it would be required to the reduced speed rotation ~~must be~~ engage~~d~~ and disengage~~d~~, and to be~~comes~~ relatively large, but by placing clutch C1 between the input shaft 2 and the sun gear S1, the engaging and disengaging of the

rotation of, the input shaft 2 by ~~from this~~ clutch C1 ~~causes the~~ indirectly reduced speed rotation output from the ring gear R1 of the planetary gear PR ~~to be~~ engage~~d~~s and disengage~~d~~s, ~~and~~ the clutch C1 can be made more compact, and therefore the automatic transmission can be made more compact.

Further, the automatic transmission device 1_{24} according to the present embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fifth speed forward. Therefore, ~~at~~ in first speed forward and fourth speed forward, the gear ratio can be more precisely set to improve efficiency and ~~specified in a detailed manner, and particularly~~ when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be operated more efficiently ~~utilized with better revolutions~~, and better ~~this contributes to increased~~ fuel economy is achieved ~~of the vehicle~~ while running at a low to medium speed.

In this embodiment also, ~~Now, the linking member (in particular~~ the transmitting member ~~M2~~ for linking the planetary gear unit PR and ~~the planetary gear unit~~ PU requires rigidity to withstand the reduced speed torque that is input. For example, ~~in the case of configuring~~ a clutch that engages at a slow to medium speed and ~~or~~ a clutch that engages and disengages reduced speed rotation~~s~~ and that is located on the radially inner ~~circumference~~ side of the transmitting ~~linking~~ member, ~~the clutches~~ must have a large capacity, therefore a~~n~~ appropriate diameter for such a large ~~to correspond with this~~ capacity becomes necessary. Therefore, in the event that the transmitting ~~linking~~

member ~~is the type that~~ passes on the radially outer ~~circumference~~ side of this type of clutch, an even ~~a~~ larger diameter ~~than the necessary diameter measurement of~~ for these clutches becomes necessary, ~~and~~ the diameter ~~measurement~~ of the transmitting ~~linking~~ member is enlarged more than necessary, and the diameter of the automatic transmission as a whole is increased. ~~becomes greater in the direction of the diameter.~~ Therefore an object of the present embodiment is to reduce ~~the enlargement of~~ the diameter ~~measurement,~~ and to provide a more compact automatic transmission.

According to the present embodiment, all clutches can be configured to avoid ~~without~~ enlarging the diameter ~~measurement~~ of the transmitting ~~linking~~ member, by locating ~~configuring~~ a clutch C3 with a small capacity on the radially ~~linking member, particularly on the~~ inner ~~circumference~~ side of the transmitting member 230.

Twenty-fifth Embodiment

~~Now, the~~ A twenty-fifth embodiment, which is a partial modification of the twenty-third embodiment will now be described with reference to Fig. 43. ~~Fig. 43 is a schematic cross-sectional diagram illustrating the automatic transmission device of an automatic transmission relating to the twenty-fifth embodiment. Now,~~ Components of the twenty-fifth embodiment which are the same as those of the twenty-third embodiment are ~~will be~~ denoted by ~~with~~ the same reference numerals, and description thereof will not be repeated here. ~~omitted, except for partial modifications.~~

As Fig. 43 illustrates, the automatic transmission ~~device~~ 1_{25} of the ~~automatic transmission relating to the~~ twenty-third embodiment ~~configures~~ utilizes a brake B3 instead of the clutch C3, and ~~makes~~ has the carrier CR1 of the second planetary gear unit PR capable of being fixed by the brake B3, ~~as compared to~~ in which respects it differs from ~~that of~~ the automatic transmission ~~device~~ 1_{23} of the ~~automatic transmission of the~~ twenty-third embodiment (see Fig. 41).

~~Within~~ In this automatic transmission ~~device~~ 1_{25}, the brake B3 is ~~configured~~ located on the ~~opposite~~ side (the right side of the diagram) of the second planetary gear unit ~~PS of~~ PR opposite the planetary gear unit PR. This brake B3 comprises ~~an oil pressure~~ a hydraulic servo 16, ~~a~~ friction plates 76, and a hub unit 233. The hub unit 233 of this brake B3 is connected to the carrier CR1, and this carrier CR1 is rotatably supported by the input shaft 2. ~~so as to be capable of rotating~~. Further, the sun gear S1 is connected to the input shaft 2. Also, the ring gear R1 is connected ~~to the transmitting member 230, and is connected~~ to the sun gear S3~~,~~ via ~~this~~ transmitting member 230. ~~Now,~~ The clutch C3, which ~~comprising an oil pressure~~ comprises a hydraulic servo 13, ~~a~~ friction plates 73, a drum ~~-shaped member~~ 225, and a hub unit 226, is ~~configured~~ located on the ~~inner circumference~~ radially inner side of the ~~above-mentioned~~ transmitting member 230, that is to say, is enclosed within ~~this~~ transmitting member 230.

The operations of the automatic transmission ~~device~~ 1_{25},

~~based on the above-mentioned construction~~ are the same as those ~~that~~ of the twentieth embodiment (see Fig. 37 and Fig. 38), and according description thereof will not be ~~omitted~~ repeated here.

In ~~As described above, according to~~ the automatic transmission ~~device~~ 1_{25} of this twenty-fifth embodiment, ~~relating to the present invention~~, since the second planetary gear unit PR and the clutch C3 are located ~~configured~~ on one side ~~in the~~ axial ~~direction~~ of the first planetary gear unit PU, and the clutch C2 is located ~~configured~~ on the other axial side ~~in the axial direction~~ of the first planetary gear unit PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be located more ~~configured~~ closely together, as compared to the case, wherein for example, two clutches C2 and C3 are located ~~configured in~~ between the planetary gear units PR and ~~planetary gear unit~~ PU, and the transmitting member 230 for transmitting the reduced speed rotation can be relatively shorter ~~shortened~~. In this manner ~~By doing so~~, the automatic transmission can be made more compact and more lightweight. Further, because the inertia ~~(force of inertia)~~ can be reduced, the controllability of the automatic transmission can be increased, and the occurrence of speed change shock can be reduced.

Further, since the hydraulic ~~oil pressure~~ servo 13 is mounted ~~provided~~ on the input shaft 2, one set of seal rings 81 serves to seal the case 3 ~~and supply oil~~ to the oil lines 2a provided within input shaft 2, and therefore oil can be supplied to the oil chamber of hydraulic ~~oil pressure~~ servo 13 without providing ~~the~~ seal

rings between, for example, the input shaft 2 and the ~~oil pressure~~ hydraulic servo 12. Further, the ~~oil pressure~~ hydraulic servo 12 can receive supply of oil from the boss ~~unit~~ 3b extend~~ed~~ing from the case 3, without passing through other ~~parts for example~~ components, and ~~therefore can~~ supply of oil is secured by providing one set of seal rings 84. Therefore, oil can be supplied simply by providing one set of seal rings 81, 84 each for of the ~~oil pressure~~ hydraulic servos 12, 13, ~~and~~ sliding resistance from the seal rings can be minimized, and therefore the efficiency of the automatic transmission can be improved.

Further, ~~since the clutch C2 is a clutch that engages while~~ in ~~at first speed reverse,~~ when ~~this~~ clutch C2 is engaged ~~at~~ in first speed reverse, the transmitting member 230 rotates in the opposite direction while the hub unit 224 that connects this clutch C2 and the sun gear S2 rotates ~~at~~ in the same ~~rotation~~ direction as the input shaft 2 ~~by engaging this clutch C2~~, and a ~~case may occur wherein~~ the ~~rotation~~ difference ~~of~~ in speeds between the transmitting member 230 and the hub unit 224 will be~~comes~~ great; however ~~but~~ because this clutch C2 is located on the ~~opposite~~ side of the first planetary gear unit PU opposite ~~PR, via~~ the second planetary gear unit ~~PU~~ PR, the transmitting member 230 and the hub hunt 224 can be ~~configured~~ spaced apart from one another. Compared to the case wherein, for example, ~~those parts~~ these components come in contact ~~due to~~ in a multiple axis construction, the decrease~~d~~ in efficiency of the automatic transmission caused by the friction produced by

the relative rotation between those ~~parts~~ components can be ~~prevented~~ avoided.

Further, since the counter gear 5 is ~~configured in the axial direction between~~ located axially intermediate the planetary gear units PU and ~~the planetary gear~~ PR, the counter gear 5 can be ~~configured~~ located in approximately the center ~~in the~~ axial ~~direction~~ of the automatic transmission. ~~For example, when the automatic transmission is mounted on the vehicle,~~ Again in this embodiment, there is no need for enlarg~~ing~~ement towards ~~one direction of the axis (particularly in~~ the rear ~~direction~~ (when the input side ~~from~~ facing the drive source is the front ~~direction~~) ~~can be prevented~~ because the counter gear 5 is mounted to ~~match~~ mate with the drive wheel transmission device. ~~Because of this~~ Thus, particularly in the case of a~~n~~ FF vehicle, ~~the~~ interference ~~toward~~ with the front wheels is reduced, ~~and the~~ mountability on a vehicle ~~can be~~ is improved, ~~such as the~~ and the steering angle can be~~ing~~ greatly increased. ~~for example.~~

Further, since the reduced speed rotation output to the first planetary gear unit PU from the second planetary gear unit PR is ~~made to be~~ engaged and disengaged by the brake B3, the number of ~~parts~~ components (for example drum-shaped members and so forth) can be reduced as compared to the case wherein, for example, a clutch C1 is provided. Further, the brake B3 can ~~configure~~ be with an oil line directly ~~from~~ connected in the case 3, and therefore the configuration of the oil line can be simplified as compared to the case wherein, for example, a clutch C1 is ~~provided~~ used.

Further, the automatic transmission ~~device~~ 1_{25} according

to the ~~present~~ twenty-fifth embodiment is ~~a transmission device that is~~ directly coupled ~~at~~ in fifth speed forward. Therefore, ~~at~~ in first speed forward and fourth speed forward, the gear ratio can be ~~specified in a detailed manner~~ better set for efficiency, and particularly when ~~mounted on a vehicle, in the event that~~ the vehicle is running at a high speed, the engine can be ~~utilized with~~ operated more ~~better revolutions~~ efficiently, and ~~this contributes to increased~~ fuel economy ~~of the vehicle while~~ can be increased in running at a low to medium speed.

~~Now, the linking member (in particular~~ In this embodiment also, the transmitting member~~)~~ ~~for~~ linking the planetary gear units PR and ~~the planetary gear unit~~ PU requires rigidity to withstand the reduced speed torque that is input. ~~For example~~ Further, in the case of ~~configuring~~ a clutch that engages at a slow to medium speed ~~or~~ and a clutch that engages and disengages reduced speed rotation~~s~~ ~~and~~ that is located on the radially inner ~~circumference~~ side of the ~~linking~~ transmitting member, the clutch~~es~~ must have a large capacity, and therefore a~~n~~ large ~~appropriate~~ diameter to ~~correspond with this~~ provide the required torque transmitting capacity. ~~becomes necessary.~~ Therefore, in the event that the ~~linking~~ transmitting member is the type that passes on the ~~outer circumference~~ radially outward side of this type of clutch, an even ~~a~~ larger diameter ~~than the necessary diameter measurement of those clutches~~ becomes necessary, ~~and~~ the diameter ~~measurement~~ of the ~~linking~~ tranmitting member ~~is~~ must be further enlarged ~~more than necessary~~, and the automatic transmission as a whole ~~becomes~~ must have a greater ~~in the direction of~~

~~the~~ diameter. Therefore, an object of the present embodiment is to avoid ~~reduce the~~ enlargement of the diameter ~~measurement~~, and to provide a more compact automatic transmission.

In this twenty-fifth ~~According to the present~~ embodiment, all clutches can be accommodated without ~~configured without~~ enlarging the diameter ~~measurement~~ of the linking member, because ~~by configuring a~~ clutch C3 with a small capacity is located radially inward ~~on the linking member, particularly on the inner circumference side~~ of the transmitting member 230.

While ~~Now,~~ the above first through twenty-fifth embodiments of ~~relating to~~ the present invention were described as being applicable to ~~supplying~~ a torque converter ~~to~~ an automatic transmission having transmission, the invention is ~~but should~~ not ~~be~~ so limited ~~to this~~, and any motion-starting device may be used that would transmit the torque (rotation) at start of movement. Further, while the foregoing embodiments have been described as ~~a case~~ ~~wherein this is~~ mounted on a vehicle ~~with~~ having an engine as a drive source ~~has been described~~, the invention is ~~but should~~ not ~~be~~ so limited ~~to this~~, and any drive source may be used as a matter of course, and the present invention may be applied to ~~this may be mounted on~~ a hybrid vehicle. Further, the above described ~~mentioned~~ automatic transmission is favorable for use in a FF vehicle, but is ~~should~~ not so ~~be~~ limited to this, and can be used in a FR vehicle, a four-wheel drive vehicle, or vehicles with other types of drive systems.

Further, the above first through twenty-fifth embodiments have been described as having ~~using~~ a double pinion planetary gear unit as ~~for~~ the second planetary gear unit PR, i.e., ~~used~~ as a reduced

speed rotation output means, but again the invention is ~~should~~ not ~~be~~ so limited ~~to this~~, and a single pinion planetary gear unit may also be used.

Further, the above first through twentieth embodiments and the twenty-third through twenty-fifth embodiments ~~were~~ have been described as having input ~~ting~~ of the rotation of the input shaft 2 into the sun gear S1 of ~~this~~ planetary gear unit PR, ~~and by~~ with fixing the rotation of the carrier CR1, whereby the ring gear R1 rotates at a reduced ~~rotations,~~ speed. However, the rotation of the sun gear S1 may be fixed, with the rotation of the input shaft 2 input to the carrier CR such that the ring gear R1 rotates at a reduced ~~rotations~~ speed.

Further, the first embodiment and the second embodiment have been described with the input side and the output side of the automatic transmission interchanged. ~~but should not be limited to this, and arrangements may be made wherein the~~ Likewise, the input side and the output side ~~are~~ may be interchanged ~~in an~~ for the automatic transmission according to the other embodiments. ~~as well.~~

~~Industrial Applicability~~

As described above, the automatic transmission according to the present invention is ~~beneficial mounted~~ used to advantage on vehicles such as automobiles, trucks, busses, and so forth, and is particularly suitable for use with vehicles which require reduction in size and reduction in weight ~~from~~

~~mountability to the vehicle,~~. and further require reduction in shock ~~of~~ upon changing speeds.

ABSTRACT

A planetary gear unit PR and a clutch C3 for outputting speed reduced rotation~~s~~ and a clutch C1 for connecting and disconnecting ~~the~~ input of rotation of ~~the~~ an input shaft ~~2 input~~ to ~~the~~ a sun gear S2 ~~are~~ ~~configured~~ located on one axial side ~~in~~ of ~~the~~ a planetary gear unit PU ~~in the axial direction~~, and a clutch C2 for connecting and disconnecting input of ~~the~~ rotation of the input shaft ~~2 input~~ to the carrier CR2 is ~~configured~~ located on the ~~other~~ axially opposite side ~~(left side of the diagram)~~ of the planetary gear unit PU. ~~in the axial direction.~~ By doing so, as compared to a case wherein, for example, a clutch C1 and clutch C2 are ~~configured together~~ both located between ~~the~~ a pair of planetary gear units PR and ~~the planetary gear unit~~ PU, the planetary gear units PR and ~~the planetary gear unit~~ PU can be ~~configured close~~ located more closely together, and the ~~transmitting~~ member 30 that transmits the reduced speed from the planetary gear unit PR to the planetary gear unit PU can be ~~rotations is~~ made shorter. Further, compared to the case wherein, for example, the clutches C1, C2, C3 are ~~configured~~ located on one side ~~is the~~ axial ~~direction~~ of the planetary gear units, the construction of the oil line~~s~~ is simplified.